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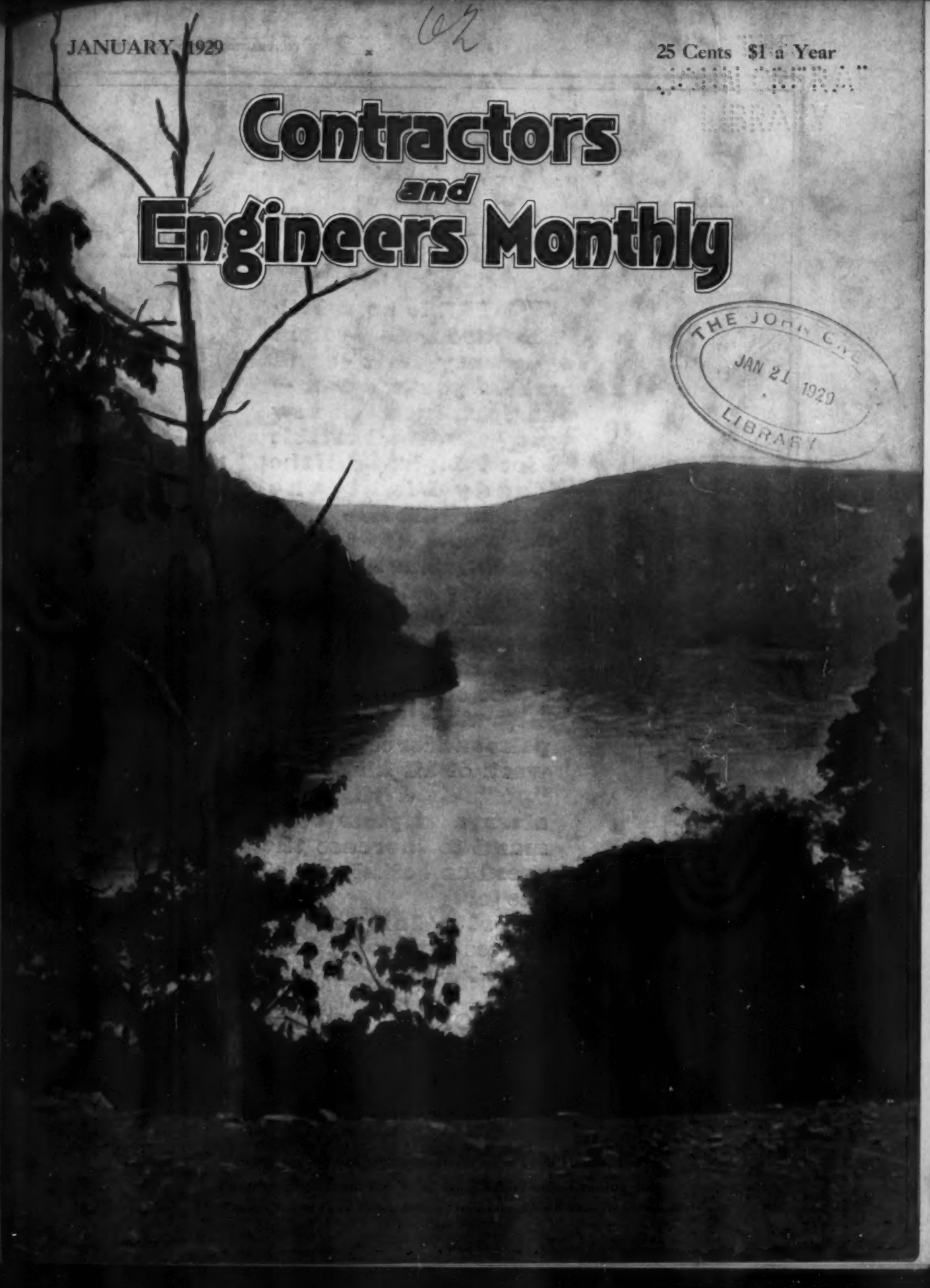

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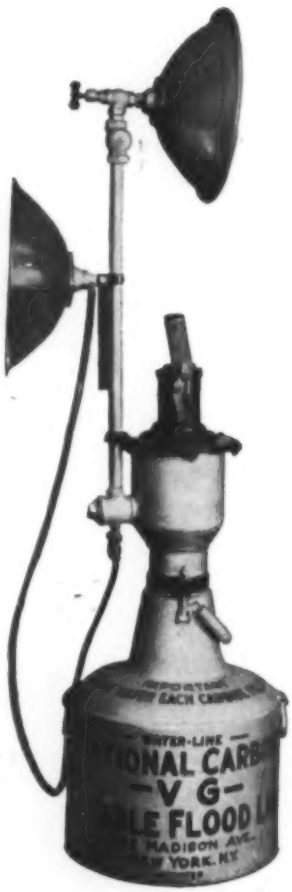

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Vol. XVIII
No. 1

Contractors and Engineers Monthly

January,
1929

7,000,000-Bushel Grain Elevator Built Between April 17 and December 1, 1928

The Barnett-McQueen Construction Co., Ltd., Fort William, Ont., Shows Remarkable Organization in Rapid Work on Saskatchewan Pool Elevator No. 7

ABOUT the middle of December, 1927, tenders were called for the foundation work for the new Saskatchewan Pool Elevator No. 7 at Port Arthur, Ont. The contract was awarded on January 12, 1928. This work included the enclosing of the water lot with a sheet pile revertment and driving piling under the various building areas to rock. In this work a total of 19,642 pieces of piling were furnished and driven, the piling being especially cut and delivered to the work by rail. In addition to the piling, 1,890,000 feet, board measure, of fir timber was shipped in from British Columbia and 298,600 pounds of iron fastenings were used to secure the sheet piling in place. A railway trestle was built for the full length of the property for handling track fill. Material for this contract required from the railway company 368 cars of piling, 86 cars of fir timber, 7 cars of iron fastenings, making a total of 461 cars for this one contract alone. This contract was completed April 15, 1928, on schedule.

Construction of Elevator

Tenders for the construction of the 7,000,000-bushel elevator were called on March 19, 1928, and on April 17, a contract was awarded to the Barnett-McQueen Construction Co., Ltd., Fort William, Ont. This contract was the largest ever placed for a grain elevator. The contractors undertook to complete the work except for the outshore storage annex on October 15, 1928, and it was on that date that the first two carloads of grain for testing purposes were taken into the elevator and on October 23 the elevator was placed in commercial operation with a total of 30 cars put through in the morning. The entire contract was completed by November 1, 1928, and the outshore annex by December 1, 1928.

Considering the size of the project the construction of Pool Terminal No. 7 constitutes a world record for speed of construction and one for which the Barnett-McQueen Construction Co., and W. R. Grant, General Superintendent in charge of the construction, may well be proud.

The records that are now being made on the construction of elevators at the head of the Great Lakes and elsewhere are somewhat remarkable. It is not so long ago that two building seasons were required to build an elevator even of moderate size and at that time had it been suggested that work could be started after January 1 and the structure be handling grain by the fall, the suggestion would have been held ridiculous. Present rapid construction has been brought about by the special designing for speed with a high degree of efficiency on the part of the general contractor and by confining purchases to a selected list of highly organized and efficient subcontractors. Had all the material required for the gigantic undertaking been delivered by rail, about 3,900 cars would have been required, making a train 30 miles long.

Quantities of Material

The elevator structure contains 95,000 cubic yards of reinforced concrete for which over 4,000,000 board feet of lumber, 500,000 bags of cement, 110,000 cubic yards of sand and gravel and 6,500,000 pounds of reinforcing steel were used. The reinforcing rods totaled over 1,200 miles in length. The general contractors' payroll amounted to more than $700,000 and when the subcontractors' payrolls were added, the amount was well over $1,000,000. About 1,100 men were employed for the greater part of the summer on the work.

Trestle Work Replaced

It has been the universal practice in building elevators to construct approach tracks on wood trestles to avoid interference with construction work. These trestles had a life of about ten years after which they had to be filled or undergo extensive repairs. At Pool Terminal No. 7, the builders found it would cost con-

siderably less to gravel fill and this work was completed by the Canadian National Railway, together with some deliveries by barge and scow. The Canadian National Railway took advantage of the work to extend and replan its main storage yards and spurs to adjoining elevators so that the conditions for handling cars in and out of the elevators at the south end are now practically ideal. In order to complete the work of filling in the trackage at Pool Elevator No. 7 it required 300,000 cubic yards of gravel or about 11,000 carloads.

CONSTRUCTION MATERIAL HANDLING

The sand and gravel for the concrete work were all received by scows which were individually equipped with derricks and clamshell buckets to load and unload themselves. This was found to be a great advantage as when the scows came in alongside the dock, they clammed the material off on a wood tunnel which ran the full length of the stockpiles. The material was drawn off from the stockpile on a 30-inch Goodyear conveyor belt using steel spouting through the top of the tunnel for loading.

The conveyor from the stockpile discharged onto a cross conveyor feeding the hoppers above the concrete mixers. A Lakewood and a Rex one-yard concrete mixer were used. The cement was housed in a shed parallelling the inshore storage on the opposite side from the dock. The cement was handled from the shed to the mixers by means of a conveyor belt which is shown in one of the illustrations. The hoist tower immediately in front of the mixing plant had two hoists and the spouting from the mixer was so arranged that any mixer could be discharged to either hoist in the tower. This eliminated loss of time in case one mixer was put out of commission for a short period. The tower was located between the workhouse and the inshore storage and by means of spouting the concrete could be deposited for either building from either hoist.

The forms were built on adjoining elevator property and inshore from the slip of the new elevator. All material such as reinforcing, forms and machinery were handled by scows as the track side of the elevator was not available due to the depositing of fill by the Canadian National Railway for the elevator at all times.

C. D. Howe & Co., Port Arthur, were designing engineers and supervised construction for the owners.

MATERIAL HANDLING ON THE SASKATCHEWAN GRAIN ELEVATOR

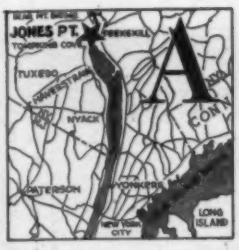
1. Sand and gravel storage piles, showing scow unloading and foundation work on Inshore Annex. 2. Concreting operations, showing cement shed and cement conveyor, sand and gravel conveyor, battery of three 1-yard mixers, concrete hoist and buggying of concrete to forms at right of hoist. 3. View of forms on adjacent property as seen from the inshore end of the slip. 4. Saskatchewan Pool Elevator No. 7 on October 18

The A G C Construction Exposition

THE Associated General Contractors of America have announced that their National Construction Exposition will be held in the Builders Building, Chicago, Ill., February 18-21, 1929. The show will be open daily from 9 A. M., the official evening closing hours varying in accordance with the entertainment program of the Associated Contractors of America.

A Federal Aid Project Near Bear Mountain, N. Y.

State Highway Contract 3196 Included Two Sections of Two and Three-Strip Concrete Paving and Rock Excavation



N interesting concrete paving job, awarded on a bid of $397,011.55 to Dyer, Kane Co., Passaic, N. J., was pushed with energy from May 18, 1928, through to the shutting down of concreting operations in November. The project extends from Tomkins Cove, N. Y., along the west shore of the Hudson River about 35 miles north of New York City in two sections, totalling 3.5 miles in a distance of 5 miles. About 10 per cent of the project is relocation. Traffic through the work was maintained by working one-half of the road at a time.

Drainage Structures

The contract included the construction of one 20-foot span reinforced concrete bridge, 46 feet wide overall with a sidewalk on one side, 12 full culverts measuring from 2 x 2 feet to 5 x 5 feet and the extension of 12 other culverts.

The contractor, who has built many pavements in cities, developed two complete new organizations for this job and it speaks well for Edward E. Dyer, President and Manager of Dyer, Kane, who had direct charge of this job, and for Major Lester Fackiner, General Superintendent and Engineer, that the work progressed so smoothly.

Excavation and Rough Grading

The grading involved the handling of about 80,000 yards of unclassified excavation, a large amount of which was rock. The equipment used for the rough grading included a Universal truck-mounted crane for handling the mats in blasting and for moving the stone for the extensive retaining wall toward the south end of the work and which is shown in one of the illustrations. Two Osgood one-yard gas shovels, one Osgood one-yard steam shovel and one ¾-yard Northwest shovel

BATCHER PLANT LOCATED AT JONES POINT, N. Y.

1. Daniel W. Brown, Resident Engineer for the State and Major Lester Fackiner, General Superintendent and Engineer for the contractor. 2. Blaw-Knox bin and batcher. 3. The stone and sand barges in the foreground and some of the old Shipping Board fleet tied up at Jones Point. 4. The Hayward bucket cleaning up the corner of the stone barge

were used to handle both earth and rock. Eight Ingersoll-Rand 10 x 8 portable compressors with 16 I-R jackhammers were distributed over the job. There was one I-R drill sharpening outfit for each end of the job. The holes drilled were from 2 to 18 feet deep and a total of more than 20 tons of Atlas dynamite was used in breaking down and shattering the large yardage of rock. On the entire length of the job, the stone varied from a rotten granite to sandstone, clay and sand, and trap rock.

A short section of excavation was sublet, and as the work did not progress with sufficient speed, Dyer, Kane put in a shovel and men to speed up the work as concreting was delayed. The contractor hired a maximum of 10 trucks for handling excavation.

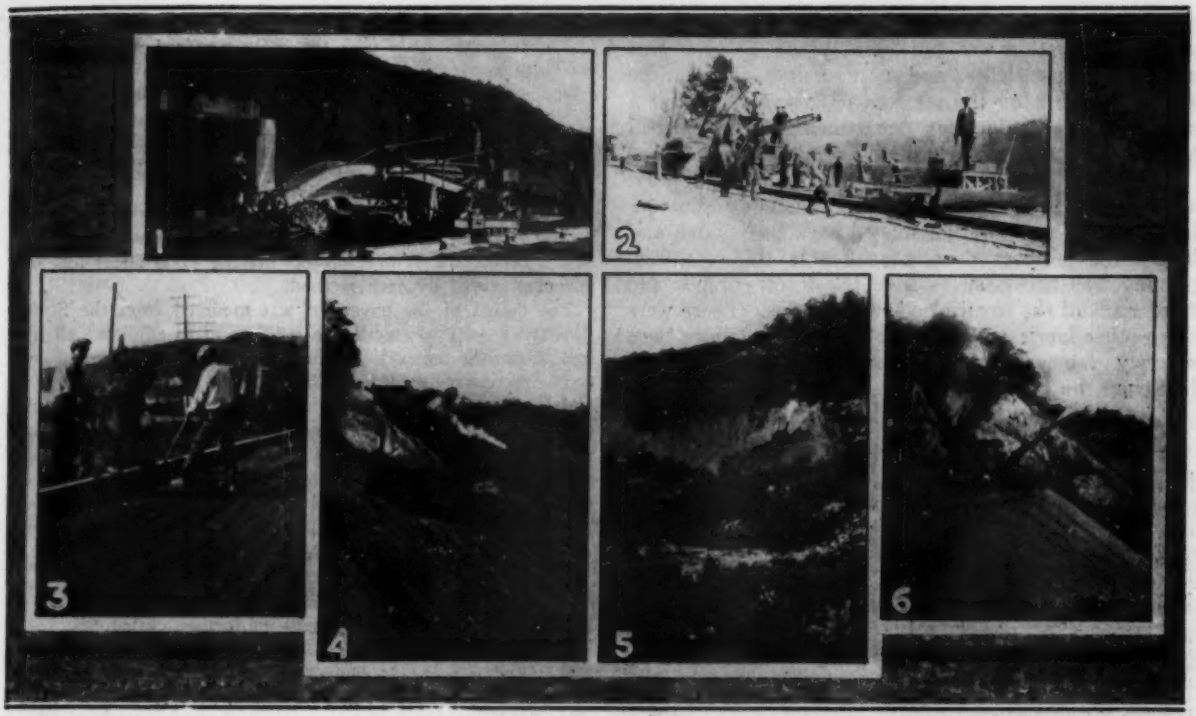
ROUGH AND FINAL GRADING

Rough and final grading were handled with an Austin-Western grader powered with a McCormick-Deering tractor and the grade was compacted with a Buffalo-Springfield 10-ton steam roller, an Austin 10-ton single cylinder motor roller and a Buffalo-Pitts 7-ton gas roller was used on the final grade.

The grading gang was composed of 16 drillers, 20 laborers and 4 blacksmiths. There was some night work extending over a period of 8 weeks to get out as

EXCAVATION AND RETAINING WALL CONSTRUCTION

1. One of the Osgood Conquerors loading a large stone into a truck. 2. View along southern section, showing houses moved back by county but still precariously perched on the edge of the cliff. 3. An Osgood steam shovel working on one of the heavy cuts. 4. A Standard Scale & Supply Co. skip loader mixing the concrete for the high masonry retaining wall. 5. Universal crane handling excavation and stone for the retaining wall



CONCRETE OPERATIONS ON THE DYER-KANE CONTRACT AND EXCAVATION FOR A PARALLEL HIGHWAY

1. Austin-Western grader working on final grade. 2. The Multi-Foote paver on the upper section with the Lakewood finisher in action. 3. Setting the Heltzel steel road forms. 4. A Bucyrus steam shovel opening a road along the edge of a hill west of the Dyer-Kane operation. 5. Compressors for drills and steam shovels shown in 4. 6. Casting to widen subgrade on same operation shown in 4 and 5

much rock as possible when traffic was light.

The final grading gang consisted of 15 men and the form setting gang of 6 men, all under one foreman. Heltzel steel forms were used throughout.

AGGREGATE

Sand was delivered by barge from the Rosoff sand and gravel plant at Marlboro, N. Y., at a point about in the center of the job, and the stone came from the Tomkins Cove quarries of the New York Trap Rock Co., also by barge.

Both sand and stone were transferred from the scows by lighter No. 6 of Graney Brothers, Inc., New York City, to the Blaw-Knox bin and batcher. The lighter was equipped with Lambert hoisting engines and a Hayward bucket.

Ward Brothers, of Suffern, N. Y., trucked the batches as needed to the 2 concrete mixers. Acme cement was delivered by rail to a siding which the trucks crossed in going from the batcher to the job where the 8 bags per batch were tossed on to the trucks.

Concreting began on September 26 with one gang on the southern section. A second gang was started on October 3 operating on the northern section. The equipment included a Lakewood finisher.

CONCRETING

The concreting gang consisted of 19 men as follows: 1 man to dump trucks and handle the hose, 1 man working on the grade, 1 mixer operator, 3 men shoveling concrete, 2 men spading along the forms, 5 men on the hand screeds and 2 men finishing and 4 men on the pipe gang who also handled the spreading of burlap and hay.

Two 27-E Multi-Foote pavers were used, one on each section of paving. A home-made scratch template pushed along the forms by hand made it possible to check the final grade and prevent its being too high and also showed up low spots which cost money in added concrete. A fill on low spots in the final grade at the mixer was hand tamped.

On the 3½ miles of paving, there were 2,900 feet with two 9-foot strips of 8-7-8 thickness, and 1,000 feet of which was widened to 20 feet on the curves. There were also about 1,500 feet of 36-foot paving composed of four 9-foot strips of 8-inch uniform thickness. The remainder was 30-foot of 8-inch uniform thickness. The pavement required 12,773 cubic yards of 1:2:3½ mix.

Carey Elastite expansion joints, ¾-inch thick and the full depth of the slab, were used throughout on transverse joints. No expansion material was used on longitudinal joints. Across all expansion joints 5 dowels were used. Truscon mesh was used in the slab for reinforcing.

Water for the south end of the job was supplied by a Worthington Metalweld triplex pump and on the north end by a C. H. & E. triplex pump.

DIFFICULTIES ENCOUNTERED

A total of 250 working days was allowed by the State Highway Department for this project. From May 18 to October 2, a total of 135 calendar days, the contractor had only 95 working days charged against him. There were many delays due to rain during June and August. On October 2, the project was 40 per cent complete on cash payments.

At three locations the work was severely handicapped

by the proximity of the West Shore Railroad. The cost of rock excavation was considerably run up as it was necessary to use lighter and more charges of dynamite and also to employ the services of a conductor and a man from the engineering department of the railroad for the protection of the railroad property.

A number of small houses on the new right of way, as illustrated, were moved back by the county, but unfortunately, they were not moved back far enough and before the job was over, considerable timber underpinning was necessary to save the front porches and front walls of the small wooden structures. There were three other houses below grade which might have been severely damaged had the contractor not materially lightened the charges in blasting in that section.

QUANTITIES AND COSTS

The total bid for the Tomkins Cove-Highland Lake job, Reconstruction Contract 3196, on State Road 593 over U. S. Route 9-W, was as follows:

Clearing and grubbing	$5,000.00
80,000 cubic yards unclassified excavation	1.70
Shoulder, 18,253 feet	.15
57,766 square yards preparing fine grade	.10
26,060 barrels of cement	2.35
3,100 cubic yards stone masonry wall without cement	6.00
57,766 square yards metal reinforcing	.25
Bridge concrete, 224 cubic yards, all classes	20.00
10,200 pounds bar reinforcing for bridge	.06
9,400 feet rustic guard rail	1.25
12,773 cubic yards, 1:2:3½ concrete without cement	8.00
47,730 feet maintaining traffic during construction	.20
Protection of railroad property	3,000.00

CONSTRUCTION CAMP

The office of the contractor which was shared by the State engineers was rather more elaborate than one would expect on a project of this type. The facade was supported by four Corinthian pillars and leaded glass windows featured the front. This was not extravagance on the part of the contractor as it had originally been built for the office of a now-abandoned sand pit which was located next to the job. The contractors picked up the house at little expense and moved it to a convenient location for use as an office.

Back of the office was a dining hall and a bunk house with 15 beds for white employees. A second bunk house about 150 yards distant contained beds for 104 for the colored help. The job averaged about 125 men throughout the season.

PERSONNEL

Edward E. Dyer, President of the Dyer, Kane Co., Passaic, N. J., had direct charge of the project for the contractors. M. J. Kane is Secretary and Major Lester Fackiner, General Superintendent and Engineer. F. G. Zimmator was Assistant Superintendent. The construction was under the direction of J. S. Bixby, District Engineer, New York State Highway Department, with Daniel W. Brown as Engineer-in-Charge for the State.

Concrete Pavement Curing Tests in Tennessee

THE most comprehensive series of concrete pavement curing tests yet undertaken was initiated during the past summer on Tennessee Federal-aid project 18-A between Memphis and Somerville. The Bureau of Public Roads is cooperating with the Tennessee Department of Highways and Public Works in this investigation which has been planned to include practically every curing method which has received serious consideration.

The general scheme of the test is to cure one side of the pavement continuously with the State standard method, consisting of application of wet burlap for 24 hours followed by a 2-inch earth covering kept wet for 10 days. For comparison with this standard curing, the other side of the pavement will consist of a series of sections, each consisting of a day's run or approximately 1,000 feet, and each cured in a different manner.

The sections will be as described and in the order tabulated below. It should be possible to repeat the entire series at least four times on the 17-mile project making 4,000 linear feet of pavement cured by each method.

The design of the pavement was modified from the State standard 8-6-8 cross section to 8-7-8 so as to eliminate all tie bars across the center joint which would restrict the expansion or contraction of one side of the slab with respect to the other and so effect the results of the test. The pavement consists of a plain concrete, 18 feet wide, with a metal center strip from which the ¾-inch pins to the subgrade are removed as soon as possible after the pavement is laid. The earth shoulder on each side of the pavement is 4 feet wide.

The following are the curing methods used:

1. Wet burlap for 24 hours—no further curing.
2. Wet burlap for 48 hours—no further curing.
3. Wet burlap for 72 hours—no further curing.
4. Wet burlap for 96 hours—no further curing.
5. No curing whatever.
6. Sisalcraft for 24 hours—no further curing.
7. Wet burlap for 24 hours followed by surface application of sodium silicate.
8. Asphaltic emulsion applied immediately after finishing.
9. Wet burlap for 24 hours followed by surface application of calcium chloride.
10. Calcium chloride admixture and wet burlap for 24 hours.
11. Coal tar applied cold immediately after finishing.
12. Hunt process applied immediately after finishing.
13. Tar paper on subgrade. Hunt process applied immediately after finishing.
14. Tar paper on subgrade. Coal tar applied cold immediately after finishing.
15. Tar paper on subgrade. Calcium chloride admixture and wet burlap for 24 hours.
16. Tar paper on subgrade. Wet burlap for 24 hours followed by surface application of calcium chloride.
17. Tar paper on subgrade. Asphaltic emulsion applied immediately after finishing.
18. Tar paper on subgrade. Wet burlap for 24 hours followed by surface application of sodium silicate.
19. Wet burlap for 24 hours followed by dry earth curing.
20. Wet burlap for 24 hours followed by ponding.

For each experimental section it is planned to cast 24 concrete beams 6 by 6 by 46 inches in size—12 on the wet earth curing side and 12 on the experimental side. These specimens will be cast in three groups of four specimens on each side at approximately equal intervals throughout a section. The molds will be removed at the end of 24 hours and the sides of the specimens protected from drying out by means of tar paper, against which earth will be banked. The subsequent curing will be as nearly as possible like that of the adjacent pavement section. In addition there will be cast for each experimental section one set of four beams which will receive no curing whatever. Beams will be tested at the age of 3, 7, 14, and 28 days. The length of the beams is sufficient to permit a test on each beam at each of these four periods. This will give 28 tests for modulus of rupture of concrete for each age and for each test section—12 on the standard curing side, 12 on the experimental curing side, and 4 on the beams which are not cured.

Detailed observations as to temperature, humidity, wind velocity, rainfall, condition of concrete, etc., are made.

Methods of Construction on the Starved Rock Lock and Dam

By Charles M. Coff

Construction Engineer, Woods Brothers Corp., Lincoln, Neb.

SUCCESS in any enterprise is more nearly accomplished when a plan of procedure is adopted in advance and that plan followed. Large construction projects must be planned so as to coordinate all activities and promote efficiency on the job. Such is the case with the Starved Rock lock and dam project on the Illinois River. This project is the lower unit of a series of five locks which are being constructed for the Illinois Division of Waterways. It is located on the Illinois River about 8 miles below Ottawa, Illinois, and opposite Lovers Leap in Starved Rock State Park. The project involves the construction of a lock and dam. This lock and dam form a letter "L."

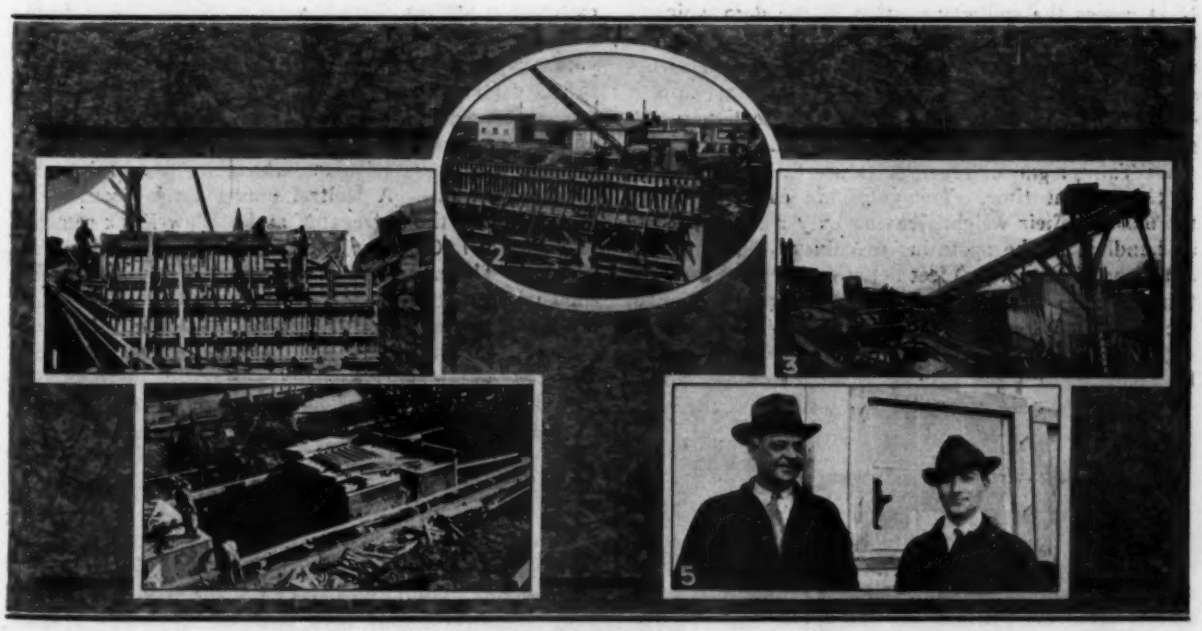
The lock is 110 feet wide, 38 feet deep and has a usable length of 600 feet in the clear. It is designed to accommodate barge tows of 9,000 tons. This is equivalent to six railroad trains of fifty cars each. The lift in this lock is 16 feet. The head of water is to be utilizied to operate an hydro-electric plant of approximately 20,000 h.p. capacity. The proposed power house location is on the lower side of the head gate section of the dam. The lock runs approximately east and west.

Protecting walls along the shore line are provided which serve to hold the banks out of the approaches to each end of the lock, and to guide ships in and out of the lock. The upper approach wall serves to guide ships and consists of a series of piers spaced 20 feet apart and topped with a massive concrete slab. The total length of this wall is approximately 580 lineal feet. The lower approach wall on the land side of the channel is of the gravity type and is about 594 lineal feet long.

The excavations in the lock were done behind protecting levees with draglines and gas shovels and industrial equipment. The headgate structure for the proposed power house is 520 feet and is built up of three principal parts: the footing, the piers and the top slab.

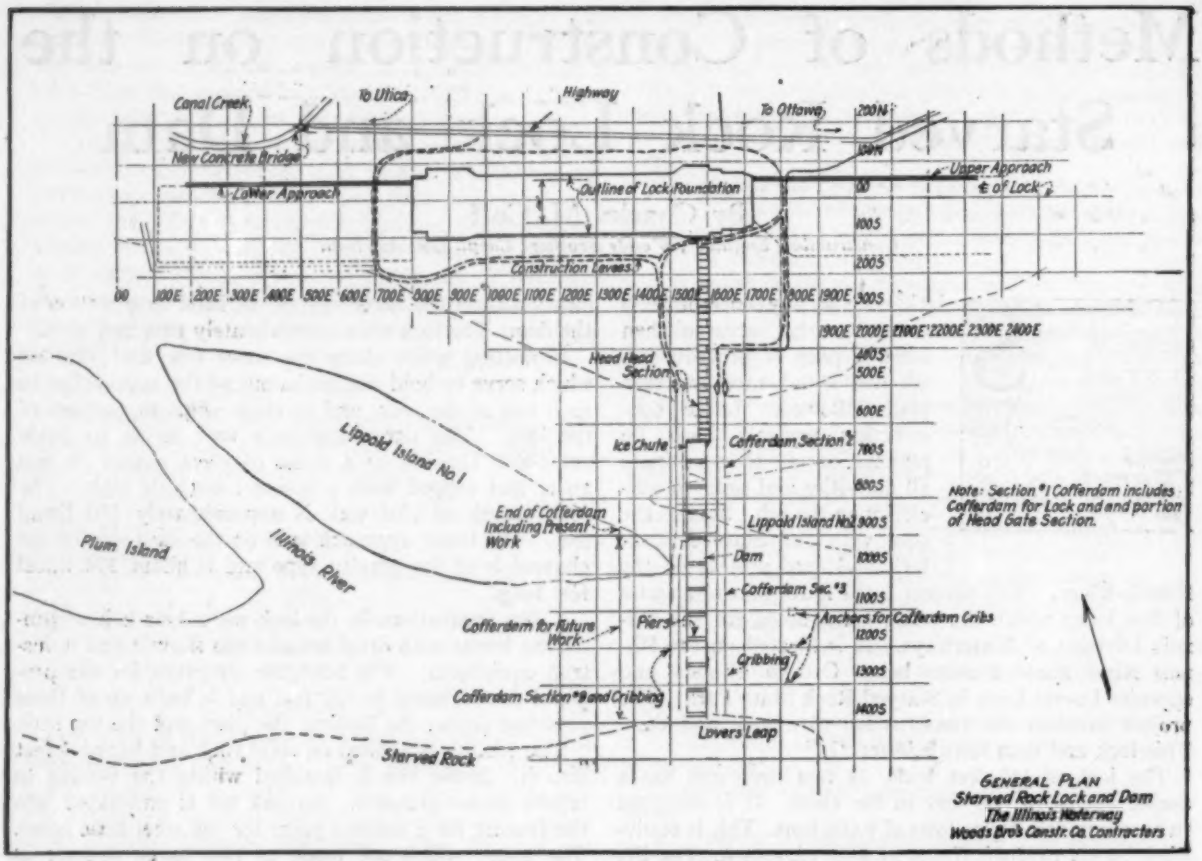
The footing is bedded on solid rock and keyed 4 feet into it. Sewer tile is installed within the footing to relieve under pressure. An oak sill is embedded into the footing for a contact point for the steel head gates. The gates, which are made in two parts, operate in slides in the piers and seal up the 14-foot spaces between the 30 piers.

Next to the headgate is the ice chute pier, which



BUILDING THE HEAD GATE FOOTINGS AT STARVED ROCK

1. The wooden bulkhead in the Head Gate footings, made in units with 8-foot panels. 2. Forms for the Head Gate slab. 3. The Barber-Greene conveyor pouring the concrete for the Head Gate footings. This was poured at the rate of 400 yards in a 10-hour shift. 4. A typical block in the Head Gate section. 5. C. M. Coff, Engineer of Construction, and Sutten Van Pelt, Construction Superintendent



General Plan Showing Layout of the Starved Rock Lock and Dam

houses the mechanism operating the ice chute. This pier is 18 feet wide and the ice chute is 30 feet wide. Next comes the spillway portion of the dam which is made up of 4 principal parts, namely, the apron, the weir, the piers and the operating bridge. The upstream portion of the apron is keyed into the rock about 4 feet. At intervals along the spillway section are 10 piers which act as supports for the trunnions of the giant Taintor gates. These gates are the largest in use at the present time. The gates are counterbalanced for most of their weight, leaving only a small load to be handled by the operating machines. They operate in a clear distance of 60 feet between piers and are 17½ feet high. The total length of the spillway section of the dam is 680 feet, with 10 piers each 8 feet wide, taking up 80 feet. The flow through these openings will be regulated by the Taintor gates mentioned above, which are operated by machinery located on the operating bridge.

GENERAL CONSTRUCTION PLAN

Since the traction railway, which was to convey materials of construction to the job, ran down along the north side of the river, it was decided to put the construction plant on the same side. This made it desirable to construct the lock and the upper approach wall first, then proceeding to the headgate section and finally the dam.

The construction plans accompanying this article show the methods adopted for building the several parts. A central concreting plant was built alongside the material spur tracks and was served by an American 10-ton stiffleg derrick with a 65-foot boom from either cars or stock pile. Two bins, one of 100 cubic yards capacity for aggregate and one of 200 barrels capacity for cement, were built on timber bents about 18 feet above the ground. Chutes from the hoppers of each bin conveyed the material into the hopper of a Rex 1-yard concrete mixer, which was placed directly beneath the bins. A Heltzel gravel batcher was used for measuring the aggregates, and a Blaw-Knox cement batcher of 1,000 pounds capacity was used for the cement. The mixer spout was about 8 feet above the industrial tracks.

Aggregate and cement cars were hauled into the contractor's switch from the railway siding by the contractor's 40-ton Porter steam locomotive. About 30 cars of materials per 10-hour shift were handled by the engine when the concreting process was in full swing.

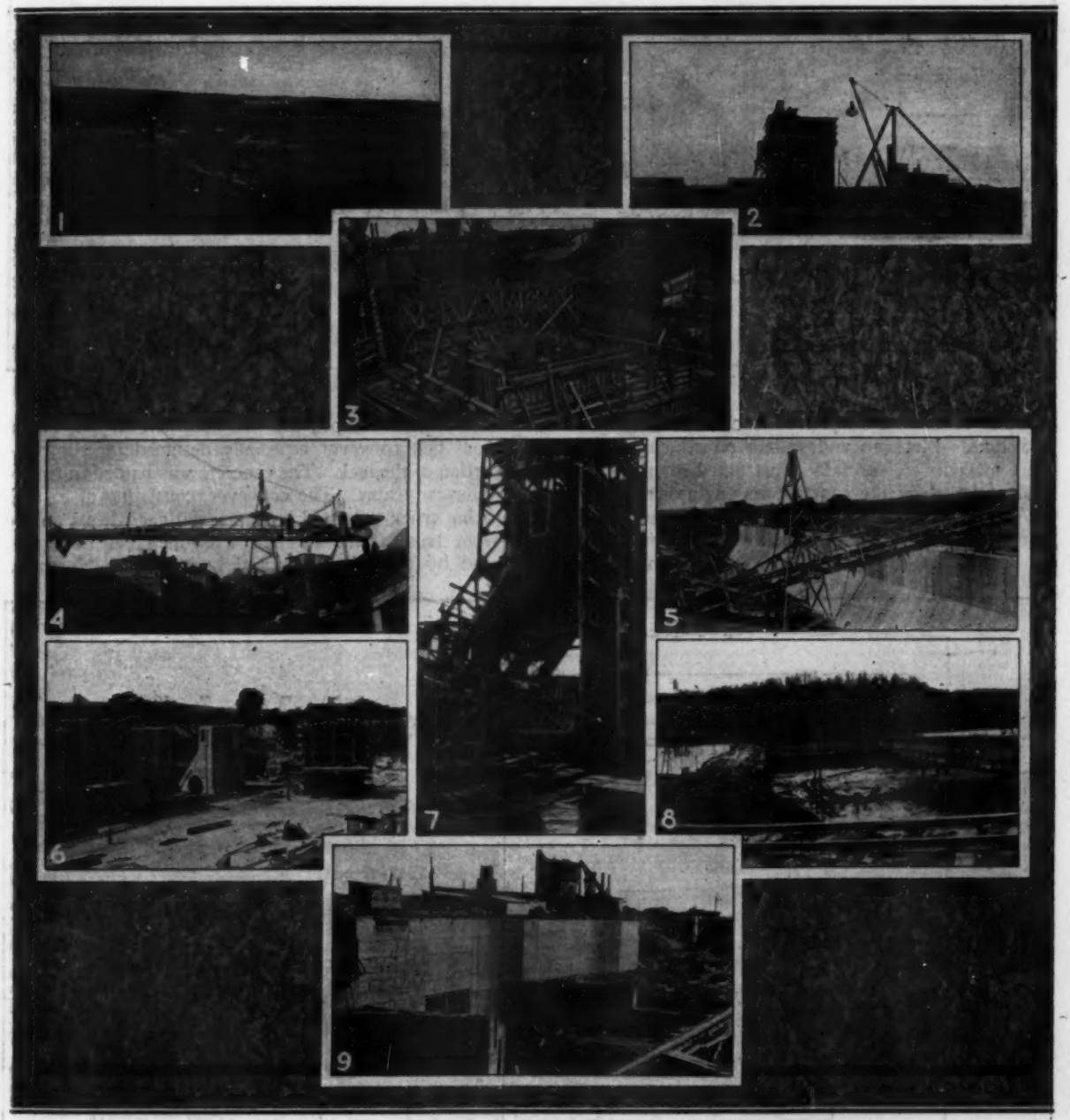
A bucket conveyor installed on the back side of the concreting plant handled the bulk cement from cars to bin.

It has been customary on most construction projects of this type to use a cableway as the main mode of transporting materials to and from the structure. This project, however, has been handled differently. The contractor employed industrial railway and belt conveyors as the principal means of transportation. In employing this method the contractor took advantage of the heavy cofferdams which must necessarily be con-

structed to keep the river out of the low hydraulic head on the dam. The industrial track was placed on the top of these cofferdams, and an incline built on a grade leading from the top to the hole in which draglines were mucking heavy shale and rock. Plymouth 8-ton gasoline-engine-powered locomotives hauled three to four 3-yard Western dump cars of muck or rock out of the holes at a time. The excavated material was used along the land side of the lock walls as filling for the proposed highway.

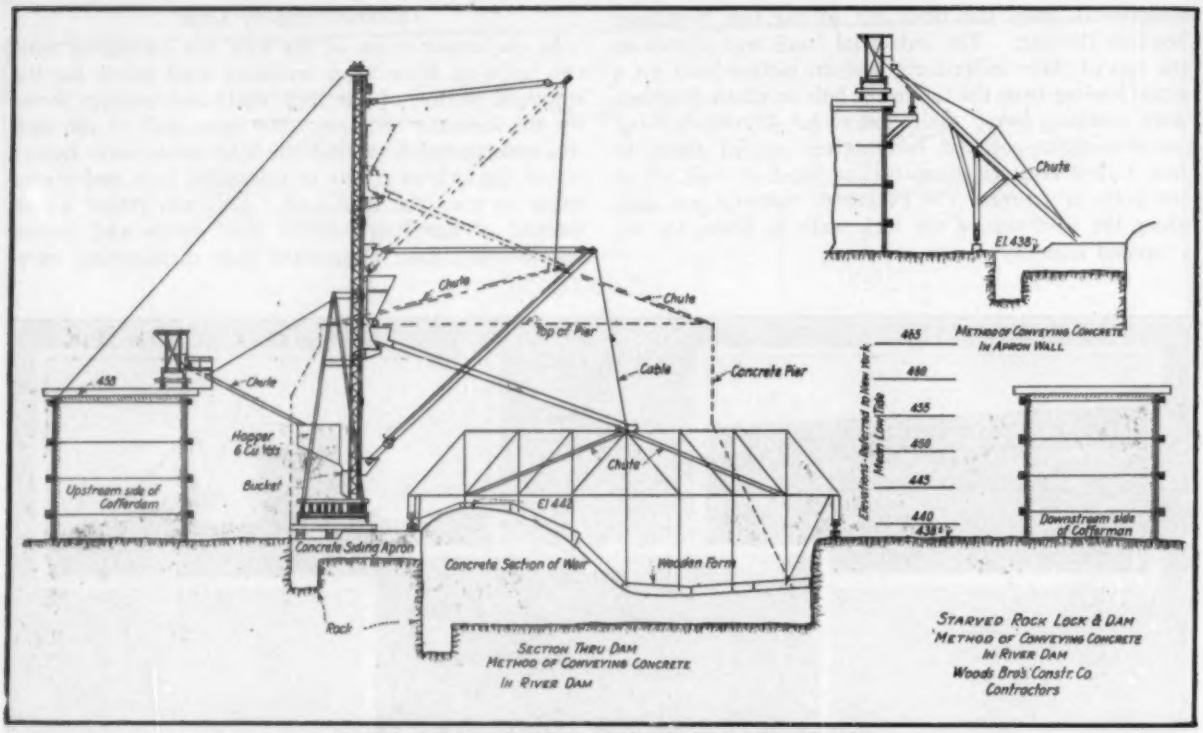
CONSTRUCTION OF LOCK

In the construction of the lock the contractor used two units of Blaw-Knox traveling steel forms for the standard section of the lock walls and wooden forms for the irregular sections. The river wall of the lock was constructed first, then the steel forms were moved across the lock on rollers in assembled form and placed ready to start the land wall. This was rather a new method of handling massive steel forms and proved considerably more economical than dismantling, mov-



PROGRESS OF CONSTRUCTION ON THE STARVED ROCK PROJECT

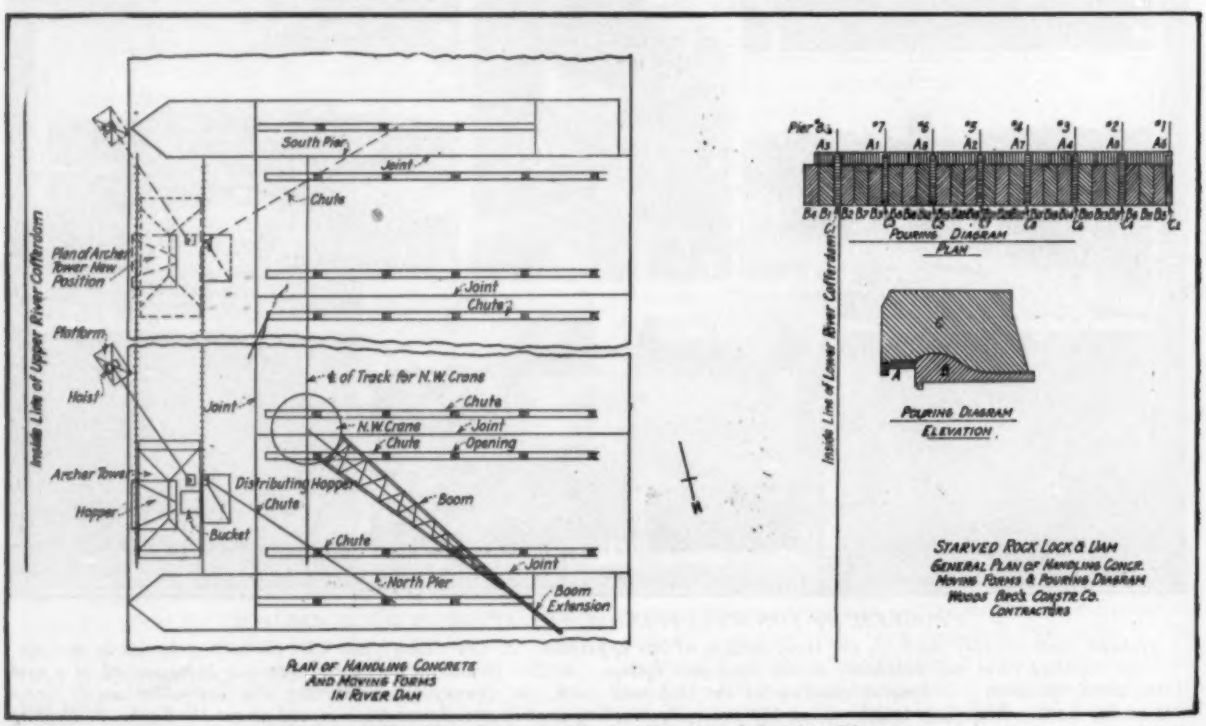
1. General view showing work on the river portion of the cofferdam. 2. The mixing plant with the stiffleg derrick in the rear. 3. The traveling form and bulkheads in the head gate section. 4. The specially constructed conveyor being moved to a new form along the berm. 5. Pouring concrete in the lock wall with the conveyor. 6. Moving the assembled steel forms across the Lock. This form weighs about 130 tons. 7. Blocking used in steel forms when moved across the Lock. 8. Drilling in the river cofferdam preparatory to building the dam across the river. 9. View from the Lock showing the concrete plant.



Method of Conveying Concrete in the River Dam Portion

ing and re-erecting in place. Each unit weighed over 125 tons. Blocking and rollers on which the forms were moved were specially constructed for this purpose and designed by the contractor's engineering force.

A unique feature of this project was the method of handling concrete to the forms. Concrete was dumped by the mixer into Lakewood 2-yard concrete cars, hauled to and dumped into the receiving hopper of an 80-foot belt conveyor especially designed for the construction of the lock. The concrete was hauled in three- or four-car trains. The conveyor, consisting of a steel hoisting truck mounted on industrial car wheels and a 77-foot truss frame carrying a 30-inch belt, was designed by the contractor and built by the Northern



Scheme of Handling Concrete, Moving Forms and Pouring Diagram

Conveyor Mfg. Co. This unit was easily moved to and fro on the industrial track, which was laid on a berm parallel to the lock forms. The conveyor frame supported a gasoline engine for power to operate the belt and a winch which moved the unit vertically as desired. It was suspended with cables from the steel truck frame and was counterbalanced to assume a horizontal position without being supported at each end while moving along the tracks. For the purpose of moving the entire unit on the track along the berm, a hand winch transmitted its power to the axle of the car wheels through a chain drive which was mounted on the hoisting truck. Concrete was poured at an average of 300 to 400 cubic yards per ten-hour shift.

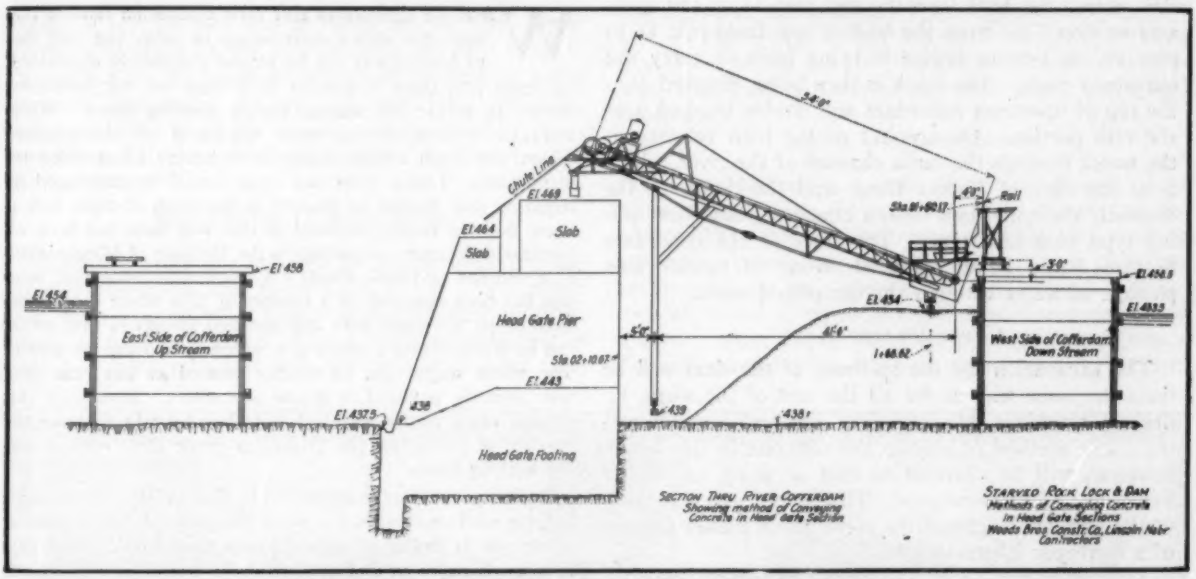
HEAD GATE SECTION

Excavated material was stripped down to rock and used as filler for the wooden cofferdam, sections of which are shown in the accompanying diagrams. Excess material was loaded into dump cars and hauled to fills behind the land side of lock walls. Shale and loose rock were taken out to a good limestone foundation. The removal of the shale and soft rock was done by blasting it into pieces which could be handled by the Northwest crane with a one-yard bucket. To effect a straight line on the top and down-stream faces of the footing, vertical holes were drilled at 6-inch intervals on both lines to a depth of from 20 to 22 feet. Then the space between the upstream face of the key and the heel of the footing was drilled with holes 4 feet apart and loaded with dynamite. These holes were blown after working hours to provide enough material for the next day's operation. The drilling into rock was done by two air-operated vertical Denver derrick drilling machines. Two men were on each machine, one man on the pump for dewatering the hole and one blacksmith to keep drills sharp for the two drill outfits. The drill gangs averaged about 600 feet of holes per 10-hour shift. Two shifts were employed on these machines. About 500 cubic feet of air per minute was furnished at 100 pounds pressure to the drills by a 120 Gardner compressor which was driven by a Climax 140-h.p. gasoline engine. A portable Sullivan compressor was mounted on trucks to stand by in case of emergency. Working alongside of the dragline and following the drills was the keyway gang of about eight men, who mucked the rock and shale for the keyway of the footing. Two pneumatic paving breakers were used to reduce the large pieces.

CONCRETE FORMS

The forms for the concrete were built in 8-foot panels in the material yard and hauled to the hole. An overhead cableway 320 feet of ⅞-inch round steel cable was employed to transport the forms from one section of the footing piers or slabs, as the case might be, to the other. The footings were poured in alternate sections.

An interesting feature of the form work was the movable trusses which supported the form making the sloping face of the footing. These trusses in unit also supported other incidental form work within the block poured. The trusses rested on bents which moved on wooden rollers on either side of the form. They were moved on these sills and rollers from one block to the next by means of pinch bars. As the construction plans show, the roller tracks were set to a definite elevation, and the formwork suspended from the trusses was adjusted to exact place by means of wedges. Vertical keys were provided in alternate blocks to tie the mass together.


Chute Line
El 469
El 464
Slab
Slab
Rail
El 458
El 454
East Side of Cofferdam Up Stream
Head Gate Pier
El 454
West Side of Cofferdam Down Stream
El 443
El 437.5
Head Gate Footing
SECTION THRU RIVER COFFERDAM Showing method of Conveying Concrete in Head Gate Section
STARVED ROCK LOCK & DAM Methods of Conveying Concrete in Head Gate Sections Woods Bros Constr Co, Lincoln Nebr Contractors

Method of Conveying Concrete in the Head Gate Sections

Concrete was hauled in 3-car trains from the mixer and dumped through a receiving hopper onto an endless belt of a Barber-Greene conveyor driven by a Le Roi gasoline engine. This whole unit moved along parallel to the dam on two single tracks.

Opposite faces of the bulkheads, which were made up in 8-foot sections, were held by ¾-inch round rods spaced 4 feet on centers threaded on both ends which passed through two 4- x 8-inch wales. These rods were left imbedded in the concrete when the forms were stripped.

The River Dam is being built in four sections. The present cofferdam Section 2 has been built to include all of the head gate section, the ice chute pier, ice chute and piers 9, 10, and 11 of the spillway sections.

At the present writing, the construction of the lock, the upper approach and everything included in Cofferdam Section 2 has been completed. Pouring of concrete started on March 16, 1927, and up to July, 1928, a total of 85,000 cubic yards had been placed.

River Dam

Since July the contractor has been busily engaged in building Cofferdam Section 3, which includes piers No. 4, 5, 6, 7, and 8, of the spillway section. The track layout plan of the river cofferdam shows how materials will be handled on this river section of the dam. The slab of the present headgate structure will be used for the industrial track from the central mixing plant as far as the ice chute pier. To cross the ice chute a bent is being built in the chute and stringers laid from the slab across the bent into the end pier 11 of the spillway section. To cross the 60-foot gap from pier 11 to pier 10, an I-beam bridge is being built to carry the industrial track. The track is then being diverted onto the top of upstream cofferdam and double tracked over the crib portion. On account of the high velocity of the water through the main channel of the river, which is at the foot of Lovers Leap, and the depth of the channel, the cofferdam design changes from sheet piling type to a crib type. The sides of the cofferdam Section 2 are being removed so as to permit free passage of water through the completed work.

Contemplated Work

The excavation for the spillway of the dam will be done the same way as for all the rest of the work, by drilling machines, blasting draglines and hand mucking. The method of placing the concrete in the forms, however, will be changed to that of using an Archer tower in lieu of conveyors. This is necessary because of the extreme height of the piers which makes the use of a conveyor impracticable.

The apron will be poured from the top of upstream cofferdam by chuting, then a single rail will be laid on it and another rail placed at about same elevation on the ground surface just past the downstream end of the spillway. Four trusses assembled in a single unit set on these rails spanning the weir will carry the curved forms which make up the spillway section. These forms are suspended by rods adjusted to exact place by turnbuckles and wedges. The truss units as shown on the sketch are moved along the rails by means of pinch bars. Alternate sections are poured. Each section is 20 feet wide and contains about 550 cubic yards of concrete. An Archer tower will be erected on the frame work of the large conveyor and rolled on rails of the apron. The tower is designed high enough to permit chuting of concrete by gravity into the piers.

Personnel

Woods Brothers Construction Co., of Lincoln, Nebraska, are the contractors for the project. The contract price for the job is $1,475,832. The work is being done under the direction of Wayne Pringle, Chief Engineer for the contractor. The personnel of the contracting company immediately in charge of the field construction are: George K. Leonard, General Superintendent; Sutten Van Pelt, Construction Superintendent; Charles M. Coff, Construction Engineer.

The project was designed by the engineering department of the Illinois Division of Waterways under the direction of M. G. Barns, Chief Engineer, W. M. Smith, Chief Designing Engineer, with C. R. Andrew, Resident Engineer for the State.

The general plan and policy on this work is to employ mechanical equipment as much as possible, have experienced crews of well paid men, and keep them contented and interested in their work. Good food and lodging are furnished. A recreation hall with a radio is installed.

The company employs George W. Widua as Safety Engineer. Mr. Widua conducts monthly foremen's safety meetings. All up to date methods and precautions are employed to avoid accidents.

Care of Wagons on Construction Jobs

WAGONS themselves give little trouble on construction work and with a spare wagon in camp, lost time due to breakdowns can be almost completely eliminated. On some jobs there is quite a little time lost by permitting drivers to grease the wagons during working hours. Wheel and axle construction on most wagons is of old-fashioned design, not much visible change in it having taken place for many years. Losses from this cause should be eliminated by requiring that wagons be greased in the camp at night and at noon, but the results obtained in this way have not been altogether satisfactory, according to the Division of Management, U. S. Bureau of Public Roads. A much more promising solution has been observed on a number of jobs where contractors have bored the wheel hubs and installed fittings so that grease can be injected with a grease gun without removing the wheels. The whole wagon can be readily greased in less time than was formerly required to grease one wheel. Even with this change, many contractors feel that they have to continue the practice of permitting the drivers to grease their wagons during working hours.

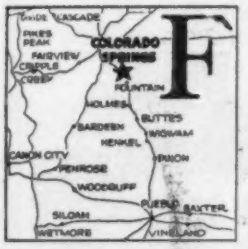
Basically, the trouble appears to be that as less and less stock is being used on construction work, the grade of labor available as drivers is falling steadily. Many contractors assert that it is much easier to find good truck or tractor drivers than it is to find men who can handle stock well. It is true that truck or tractor drivers demand higher wages, but the larger output of the equipment they handle makes it possible to pay the higher wages.

One-Way Traffic—A Caterpillar 75 Moving a House 37 Miles From the Abandoned Ghost Town of Deeth to the Thriving City of Elko, Nevada

Gold-Bearing Aggregate for Road Near Pike's Peak

By Ernest Montgomery

Division Engineer, State Highway Department, Colorado Springs, Colo.



FROM Colorado Springs to Pueblo the Colorado State Highway Department has built during the last construction season a concrete pavement 5 miles long on U. S. Highway No. 85 beginning 4 miles south of Colorado Springs. This pavement is standard 18 feet wide, 9 inches thick at the edges and 6½ inches thick at the center with transverse expansion joints every 60 feet and a metal longitudinal center strip. The contract for this job was awarded to J. L. Busselle & Co., of Colorado Springs at 22 cents per cubic yard for excavation, $17 per cubic yard for 1:2:4 structural concrete, $1.89 per square yard for concrete pavement and 11 cents per lineal foot for the metal longitudinal joint.

Difficulties Encountered

Much difficulty was experienced in obtaining the right of way and resort had to be made to the courts which was done after all other means were exhausted and then the contract was awarded. A trans-continental telephone line had to be relocated and this consumed much time and caused considerable delay in the grading operations.

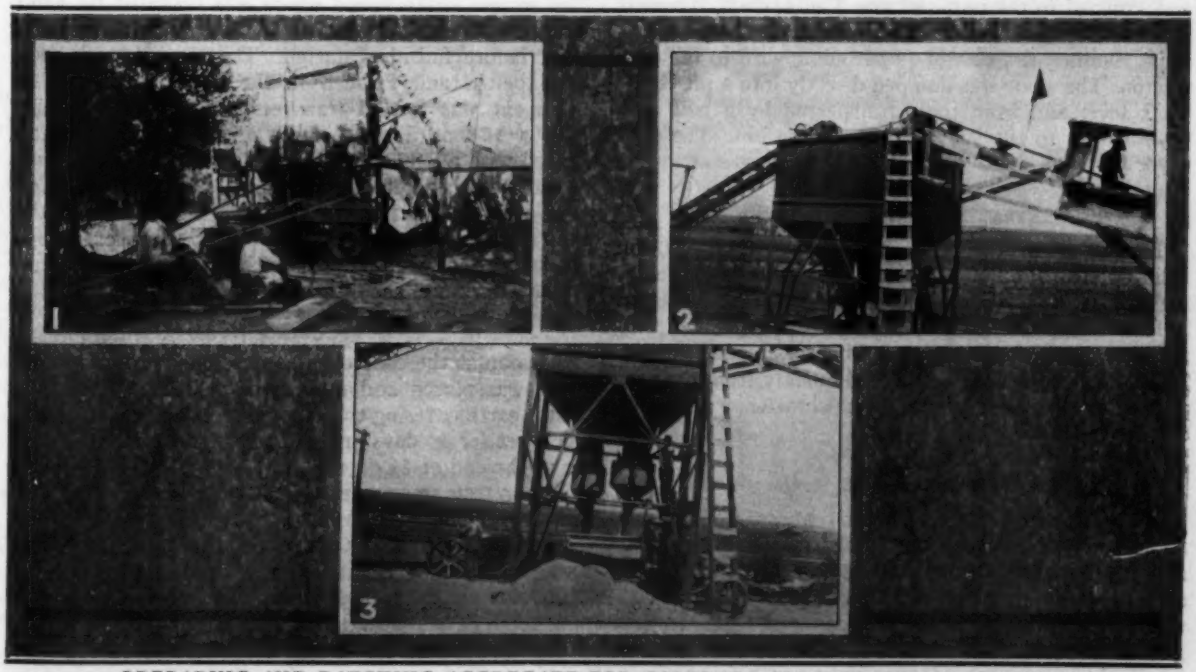
The detour problem was serious and greatly affected the grading work. The detour parallels the new construction, changing from one side to the other, occasioned by the relocation and by the different widths of paving and the centering of the roadway within the new right of way.

Grading

The grading work was handled by a subcontractor, Woodman and Bedford, Greeley, Colo., with an Austin New Era elevating grader and team outfit. The grader was equipped with a Model T Ford engine as the power unit on the conveyor and ten head of horses for motive power which worked out efficiently and economically. The grading material was loose sand, gravel and heavy soil.

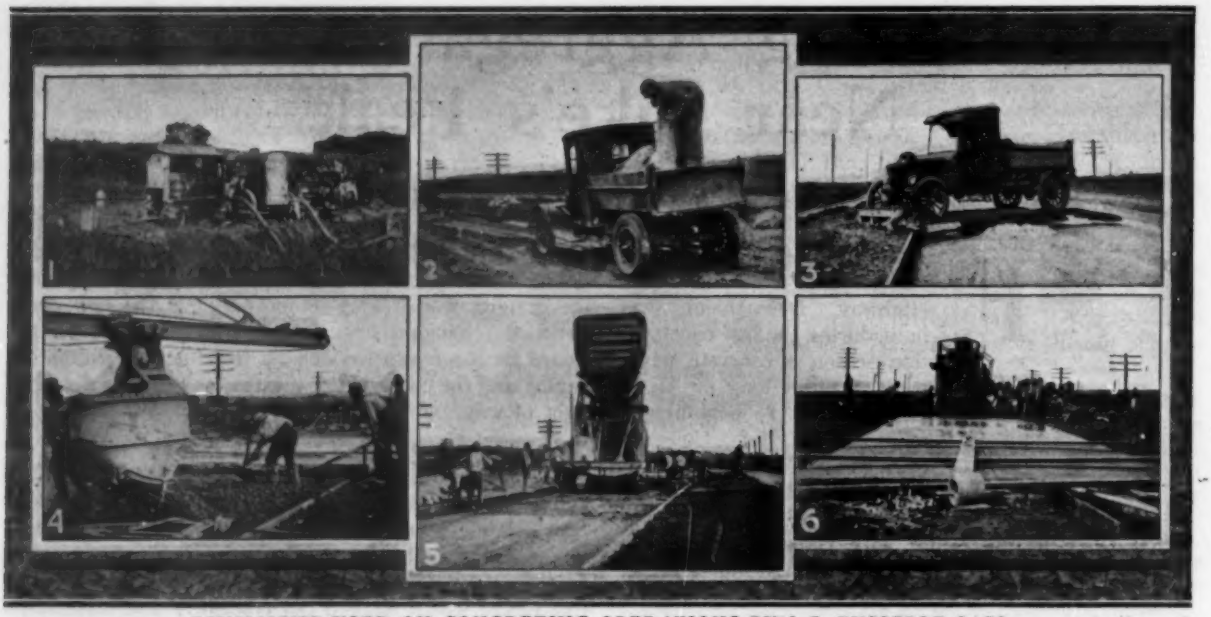
Source of Aggregates

The fine aggregate, a sand, came from a fairly large pit in a sand wash about ½-mile from one end of the proect. The sand was very clean, not requiring washing as the elutriation tests showed less than 2 per cent clay and organic matter. About 8 per cent oversize was encountered and screened out. The sand was excavated with a dragline bucket operated by a cableway using a Fordson tractor with a double drum hoist. The sand



PREPARING AND BATCHING AGGREGATE FOR COLORADO SPRINGS-PUEBLO HIGHWAY

1. Sand plant showing bins, bucket elevator and truck loading. 2. Conveyor belts delivering sand and stone to the Johnson bin. Sand coming from left and rock from right. Man at right is hand picking and discarding oversize stone. 3. Weighing batchers delivering batch to truck



EQUIPMENT USED ON CONCRETING OPERATIONS BY J. L. BUSSELLE & CO.

1. C. H. & E. triplex pumps furnished water for the mixer and curing. 2. Emptying the seven bags of cement on the batch before the truck went on to the turntable. 3. Truck on the Blaw-Knox turntable. 4. Spreading concrete and using the hand strike-off. 5. The Koehring 27-E paver with skip up. 6. Active paving operations showing the mixer, strike-off, and in the foreground the bridges for hand finishing and the hand belt

was elevated to a revolving screen by the bucket conveyor from whence it went to a bin and then was hauled 3.4 miles to the bins at the central proportioning plant by hired Ford and Chevrolet trucks.

The coarse aggregate was composed of crushed rock obtained from the world-famous gold-mining camp of Cripple Creek. This waste rock from mining operations was crushed to the required size 3 to ¼-inch, screened and loaded in standard railroad dump cars and shipped some 50 miles at a cost of $2 per cubic yard to the contractor. The stone was dumped directly into a pit below track level and from there transferred by a belt conveyor either to the stock pile or to the bin. The conveyor belt was fed automatically simply by starting it.

CENTRAL PROPORTIONING PLANT

The central proportioning plant consisted of a 50-ton Johnson steel bin equipped with measuring and weighing devices, easily controlled and very quick in action in loading the trucks. The aggregates were loaded into the bin by belt conveyors set at about a 22-degree angle. The batch trucks were dispatched quickly from the proportioning plant and turned on a Blaw-Knox turntable on the subgrade.

CONCRETING

A 27-E Koehring gas-engine-driven mixer with boom and bucket was used on the grade, mixing the concrete as the materials were delivered by the trucks from the central proportioning plant. The mixer was equipped with an automatic timing device and water control gage. The timing device was locked at the required specified mixing time of 1½ minutes. The water was so controlled that it met the water-cement ratio specifications not exceeding 6 gallons to the sack of cement, due account and allowance being made for the moisture content of the fine and coarse aggregates.

The concrete after being mixed was deposited on the subgrade with a bucket in a way to cause the least amount of hand work and struck off to grade with two strike boards. The first of the strike boards was attached by cable to the bucket and as it returned for another batch, it saved much hand labor in spreading. The second strike board which was operated by hand was then used to bring out any inaccuracies in the pavement before finishing started. The concrete was then hand belted and finished in the usual manner. The pavement was floated transversely and longitudinally with a 10-foot float 8 inches wide, the joints being floated with a long split float and then edged.

Water for concrete, as well as for curing was supplied from wells and irrigation ditches in the vicinity of the road and was pumped by C. H. & E. Simplex pumps through 2-inch water lines which was really too small for the work and should have been a 2½-inch line.

CURING

As soon as the concrete was hard enough burlap covering was placed and moistened until such time as a 2-inch earth covering could be placed. The concrete was kept wet for 10 days and the pavement opened to traffic at the end of 21 days.

Slump tests were taken several times during each day for record. One set of four test cylinders was also taken each day, sometimes two sets for a 14- and 28-day test. All cylinders broken exceeded the specifications of 3,000 pounds at 28 days by an average of 1,000 pounds and some have shown as high as 5,100 pounds.

An average of 660 lineal feet of pavement 18 feet wide was laid for the actual working days on the job. There was some loss of time due to broken pumps, wet weather and the time taken for breaking in a new gang of workmen.

Stopping Landslides on Highway Fills

Abstract of a Report by George E. Ladd, Associate Economic Geologist, U. S. Bureau of Public Roads, in West Virginia, Ohio and Southwestern Pennsylvania

THE conditions which have led to landslides on highways are: where a cut has been made in tilted strata on the down dipping side in such material as sandstone, limestone and solid shale beds; where a vertical or nearly vertical face has been left in a cut in solid shale, jointed shale, or jointed shale and sand stone, and material is precipitated as the result of frost action or slippage on interbedded seams of water softened clay; accumulation on hillsides and in gullies on the sides of high hills of detritus consisting of clay and silt from decomposed or weathered shale, highly rounded sand and sandstone fragments and boulders which make a more or less fluid mass when sufficiently wet; beds of plastic or fire clay, especially near the surface; plastic clay coatings formed on slopes beneath detritus by the wetting and softening of comparatively pure shales; artificial fills made of materials of the general character described above.

Water plays a very important part in causing slides, both by lubricating and increasing the weight of materials.

Avalanche Type of Slide Removed by Steam Shovel

In the vicinity of Lyburn, Logan County, W. Va., in the spring of 1927, a landslide occurred on a hillside where a cut had been made partly in shaly sandstone and partly in overlying detritus. Where the slide occurred the material was all detritus. This slide was 200 feet wide at the bottom, measured along the road and extended up the hill for a distance of over 800 feet. At the upper end it divided and detritus moved from two forks.

The highway is on a narrow bench about 60 feet above a branch of the Chesapeake & Ohio Railroad which, in turn, is about 20 feet above the Guyandot River. The slide buried the highway to a depth of 25 feet or more, and, crossing the road, buried the Chesapeake & Ohio tracks below. Steam shovels at each end of the slide worked for 30 days opening the highway for traffic. Trucks had to haul the detritus 2 miles at one end and 7 miles at the other. Ten thousand cubic yards were removed from the highway. The railroad was blocked for about four days until track could be relaid upon the bench widened by the slide.

The slide was of the avalanche type, rare in this area, and except for a small subsequent movement was over in less than two hours. The detrital material contained an extremely small amount of clay, a great deal of rounded sand, and an abundance of sandstone fragments and boulders.

It caused considerable indirect damage, especially to the railroad which normally handles a large tonnage of coal over this branch. During this tie-up 15,000 people were supplied with food by carrying supplies over the slide, with truck delivery at both ends.

The fact that the cut was in detritus for the entire width of the slide, considered with topographic evidence, indicates original development of a gully by ancient slides and the subsequent filling by numerous lateral slides. This one occurred following a heavy rain which saturated the porous detritus, lubricated the small amount of clay and rounded sand particles, added the weight of a large volume of water, and so started the movement down the mountain side which at this point has a slope of about 45 degrees.

Except in suddenness of occurrence, this slide typifies those which come upon the road and leave a large yardage to be removed by steam shovel. The direct costs to State and railroad were over $30,000. Further slides do not appear to be impending in the immediate future, but the mass of material above the road indicates that slides will recur at some future time.

Slide Temporarily Controlled by Log Cribbing

Near Barnabas, Logan County, W. Va., a slide moved down onto a road at intervals for four years. As in the Lyburn slide, there was an exceptionally thick accumulation of detritus in a ravine formed by an old slide. Such an accumulation can very easily occur in the sandy, rocky materials of the local detritals. A large water supply reaches the area of the slide because of topographic conditions and the volume retained is great as a result of unusual thickness of detritus and its porous nature. This slide necessitated removal of 32,000 cubic yards of material with steam shovels.

Fill Slide at Lee's Creek, W. Va.

Following the last clean-up, cribbing was installed to check the slide. White-oak logs 12 to 14 inches in diameter at the butt and 12 feet long were placed in a manner similar to that illustrated. The tie logs extending back into the slide were at intervals of 4 to 5 feet. Slope adjustment of the detritus, which began shortly after the setting of the cribbing, buried everything but the face of the cribbing, but the movement was finally halted. Previous expenditures at this point by the county have amounted to $17,300. The cribbing described above cost $2,200 for logs and $2,500 for labor. The slide is now apparently controlled; but the control is only temporary as the cribbing timbers will rot and it is probable that the detrital mass will again move upon the highway.

RETAINING WALL HOLDS SIDEHILL FILL

In Green County, Pa., between Washington and Waynesburg, the highway traverses a hillside for a considerable distance. The surface material is decomposed shale, which freely absorbs water, as evidenced by crawfish holes in fields on both sides of the road. In many places side fills built of this unstable material go out and undermine the pavement. At one or two points drainage methods which will be described later have been employed for control of such subsidences, but in most instances where trouble has been encountered reinforced concrete retaining walls have been built on the lower side of the road. These walls have held the road in place. One typical wall is 150 feet in length, 13 feet high, and rests upon a 9-foot footing which is set from 3 to 5 feet in solid shale. Such a wall costs about $8,500, or about $57 per running foot.

Side Fill Slides and Resulting Damage to Highways

SATURATED FILL OVERTURNS RETAINING WALL

On West Virginia Federal Aid Project No. 19, at a point known as White Rock on the West Fork River, a retaining wall was built on the river side to hold a side fill in place. The highway is located about 50 feet above the river and the wall was founded on solid rock which outcropped along the river bank near the low-water mark. The gravity-type wall was keyed into the rock in the usual manner and was approximately 60 feet in length, 15 feet in height, and 6 feet thick at the base. A fill consisting of some shale and rock, but mostly of weathered detritus, was placed back of the wall and extended from its top to the highway on a slope of 45 degrees. Drainage channels were left in the wall.

After completion of this wall there was a period of high water in the river which lasted for several days, and the water rose to approximately the top of the wall. It then fell rapidly, and within a few days was back to normal. Shortly afterwards the wall toppled over into the river. There was no breaking of the concrete. The wall remained intact, lying on its side in the water.

The explanation is simple. During the flood stage water flowed in through the weep holes and around the ends of the wall, thoroughly saturating the fill back of it. This caused no damage as long as the river was up, but when it fell to normal stage it removed the compensating pressure from the face of the wall; and the saturated material back of it, which exerted a more or less liquid pressure against the concrete, plus the effect of the surcharge of the fill above, caused the failure.

Another wall failure occurred in Putnam County, W. Va., where a cement-rubble retaining wall, 200 feet long, set in shale about 75 feet beyond, and well below the road shoulder, went out during a rainy spell. The cause in this case was apparently an excessive surcharge of the saturated fill above. A number of natural slides occurred at the same time in the vicinity, one of them about 100 feet from the toe of the wall.

SLIDING FILL PROVES DIFFICULT TO CONTROL

About 1912 Cabell County, W. Va., took over a section of abandoned railroad right of way from the Chesapeake and Ohio Railroad between Barboursville and the Putnam County line east of Huntington. On this grade the county built a 16-foot grouted brick pavement on a concrete base. The State Road Commission of West Virginia took it over for maintenance on January 1, 1922.

The road crosses a deep ravine on a fill about 450 feet long at Lee's Creek, 2½ miles east of Milton.

During the winter of 1924-25 a section of the fill near the west end started to move from under the pavement on the north side. In the spring the movement increased and it was necessary to support the pavement by tamping rock and other materials under it. A section about 40 feet long and half the width of the pavement finally failed.

In September, 1925, widening of the fill on that side was begun. In order to compact the new fill as much as possible, it was put in with wheel scrapers, starting at the toe of the old fill. The new fill was carried up about 10 feet wide and was kept level, the teams traveling the whole length of the fill in going to and from the borrow pit.

This work was completed the latter part of September. During the winter of 1925-26 the new fill slid off at the same place where the old fill had settled, carrying still more of the old fill with it. About this time it was noticed that the ground at the toe of the fill was rising in front of the slide. This continued, as the movement of the fill progressed, until a section averaging 20 feet wide and extending about 100 feet along the toe of the fill had been lifted from 3 to 6 feet above its original elevation.

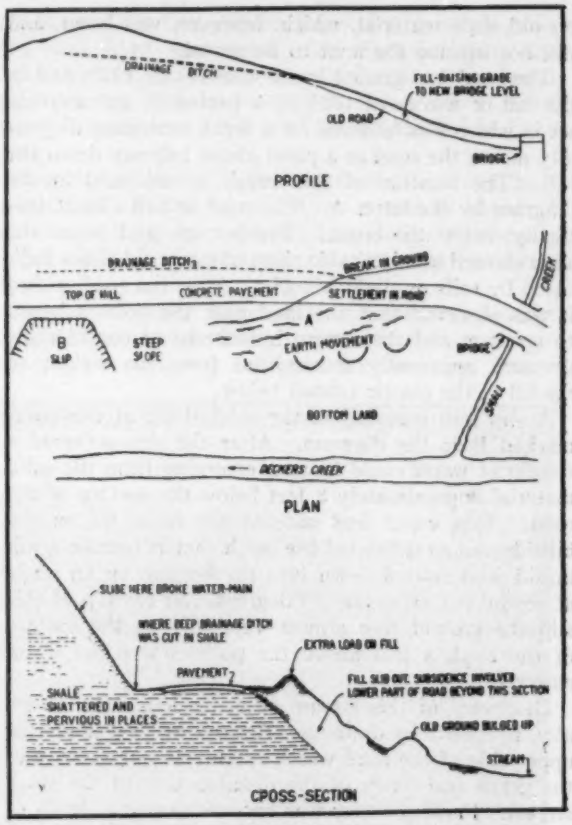
In the spring of 1926 churn drill soundings were made parallel with and at the toe of the fill. Rock was found at elevations varying from 4 to 12 feet below the ground surface, the latter elevations being near the center of the fill.

It was decided to set well casing filled with concrete in this stratum. A well drill was used to sink 8-inch holes through the detritus and 8 feet into the rock, which seemed to be a fairly hard sandstone. Well casings, 6⅝ inches inside diameter, were set in these holes and filled with concrete. Where the rock was more than 8 feet below the surface, four ½-inch reinforcing rods were set in each casing. One hundred and twenty of such casings were set on 3-foot centers. After these casings were completed, the slope of the fill was trimmed and ditched and no pockets were left to catch water.

During the winter of 1926-27 the fill continued to settle, although to a somewhat less degree than during the two preceding winters. Early in the spring of 1927, 12 of the casings where the rock was deepest showed signs of bending over. By the summer of 1927 they had failed completely. These were the casings which had been reinforced. The fill continued to sink from under the pavement in a section 40 feet long. The break which had previously extended onto the center of the pavement now covered nearly the whole width. No sign of slipping appeared on the opposite side of the fill.

In April, 1927, a core drill was used to sink a line of holes parallel to the curb and about 2 feet from it across the entire north side of the fill. Nothing but fill material and detritus was encountered to a depth of from 38 to 52 feet below the pavement except a few scattered boulders. The greatest depth to rock was in the bed of Lee's Creek, which crosses the fill about one-third of its length from the east end.

In August, 1927, one hundred and twenty-two 25-foot oak piles were driven parallel to the pavement and about one-third of the distance up the slope from



Conditions Surrounding Slides on Bell Hill Near Morgantown, W. Va.

the casing. These were spaced 3 feet apart. In October the fill was brought to the proper cross section by addition of new material. This material was distributed by hand so as to have the slope as uniform as possible.

At present the slide movement seems to have stopped. There is still a little settlement in the pavement, but this is to be expected as normal settling against the piling.

Drainage Proves Effective in Stopping Slide

One of the most interesting and instructive cases of slide and fill subsidence occurred on a highway on Bell Hill about 1 mile east of Morgantown, W. Va. An old county road descended the hill to a small valley where a bridge crossed a stream. The old road had required a small cut in shale and some underlying detritus on the hillside and the material had been thrown over the side and constituted a moderate fill. A number of years passed without record of noteworthy trouble.

When the road was improved by the State as a Federal Aid project it was thought best to locate it further into the hillside on more solid material. The new road was placed 10 feet back in the hillside, the bridge approach was raised 6 feet, and a new bridge was constructed. The hillside cut furnished material for the wedge-shaped fill downhill to the bridge, and a large surplus which was dumped on the hillside fill making a very wide shoulder. The load on this fill was increased by building a high bank on the outer shoulder to serve as a guard for traffic. All of this was dumped

on old slide material, which, however, was berm, and did not involve the area to be paved.

The road was graded in the summer of 1925, and in the fall or winter of 1925-26, a period of wet weather set in which was followed by a break extending diagonally across the road at a point about halfway down the hill. The location of this break is indicated in the diagram by the letter A. The road settled almost vertically, below the break. The bottom land below the slide showed unmistakable signs of many old slides indicated by rolls or slight hillocks. After the road settled it was observed that the land near the bottom began to upheave and there were indications of considerable pressure apparently transmitted from the weight of the fill to the plastic subsoil below.

A slip also occurred in the sidehill fill at the point marked B in the diagram. After the slip occurred a stream of water could be seen emerging from the solid material approximately 8 feet below the surface of the road. This water had entered the loose fill on the hillside and so saturated the earth that it became semi-liquid, and settled down into the bottom on an angle of repose not exceeding 20 degrees. At the top of this slip the ground rose almost vertically to the surface of the road, 8 feet above the point where the water emerged.

Discovery of this stream of water led, quite naturally, to control by drainage. A ditch was dug along the upper side of the road which extended from the top of the grade two-thirds of the distance toward the small stream. Flowing water was encountered at a depth of approximately 8 feet. The ditch was carried approximately 10 feet deep and into solid rock, and an 8-inch tile drain with open joints was laid on a gradient of approximately 3 per cent. The ditch around the tile was filled with broken stone and over this several feet of cinders were placed. The remainder of the ditch was filled in with earth. This drain intercepted the water as it flowed from the rock and discharged it into the open ditch near the small stream. The drain effectually stopped the flow of water into the slip below the road. Even in dry periods the discharge of water from the drain was sufficient to fill a 2-inch pipe. The fill along the lower side of the road (at point B) was then replaced to form a shoulder, and this fill has shown no signs of settlement since that time.

The slip, marked A, was filled in with cinders and appeared to be stable. In the late fall of 1926, however, a large water main supplying the city of Morgantown, which was located on the upper side of the road, broke as a result of a slide above the road and for a number of hours discharged a large volume of water into the slip and over the road at A. This water thoroughly saturated this slip and much settlement took place in the week following the break. As the road settled it was brought back to grade with cinders, and it was used as a cinder road during the winter of 1926-27. In the spring of 1927 it was observed that very little settlement or slipping had taken place during the winter months. Careful observations were taken over a period of four months in the spring and practically no settlement was observed. A concrete surface was then laid. Shortly afterward a settlement of about 2 inches took place along the lower side of the road, but no further settlement has occurred up to the present time.

It is believed that the breaking of the water main thoroughly saturated the slip and caused the maximum settlement for such material. There has been subsequent drying out and no further settlement has taken place excepting some slight readjustments.

FALL OF DEBRIS A SERIOUS PROBLEM

Slide material precipitated in ditches and on roads is generally removed by steam shovels and trucks, but sometimes hand shoveling and trucks are used. Dribble constitutes the greater part of such material and its occurrence is very widespread. Eight steam shovels have recently been purchased for work of this character in eastern Ohio.

Often the cuts made in massive shale leave a vertical face rising to a considerable height above the road. If the shale is jointed, it is inevitable that frost action in time will precipitate large masses on the road below. Sometimes a broken condition results from heavy blasting during excavation. Similar dangerous conditions are also found in sandstone.

Vertical cuts may be left in shale if it is compact, without joints, and has not been deeply shattered by blasting. Otherwise, where possible, a suitable slope should be provided during construction. It is cheaper and safer to remove the surplus material than to have to remove it from the pavement and run the risk of physical damage, interference with traffic and possible loss of life, at a later time.

The fall of much of this small material is not economically preventable, but attention should be given to boulders and outcrops which endanger highway traffic. Projecting and unsupported sandstone and detached boulders resting in an unstable position should either be pried loose or blasted and deposited below the highway.

Cuts should not be made in strata dipping steeply toward the road unless absolutely necessary. This is especially true if the rock has seams of clay and shale, even though only an inch or so in thickness. Where such a cut is made, rock beds above should be anchored in place in advance of blasting by a system of reinforced concrete piles set in drill holes.

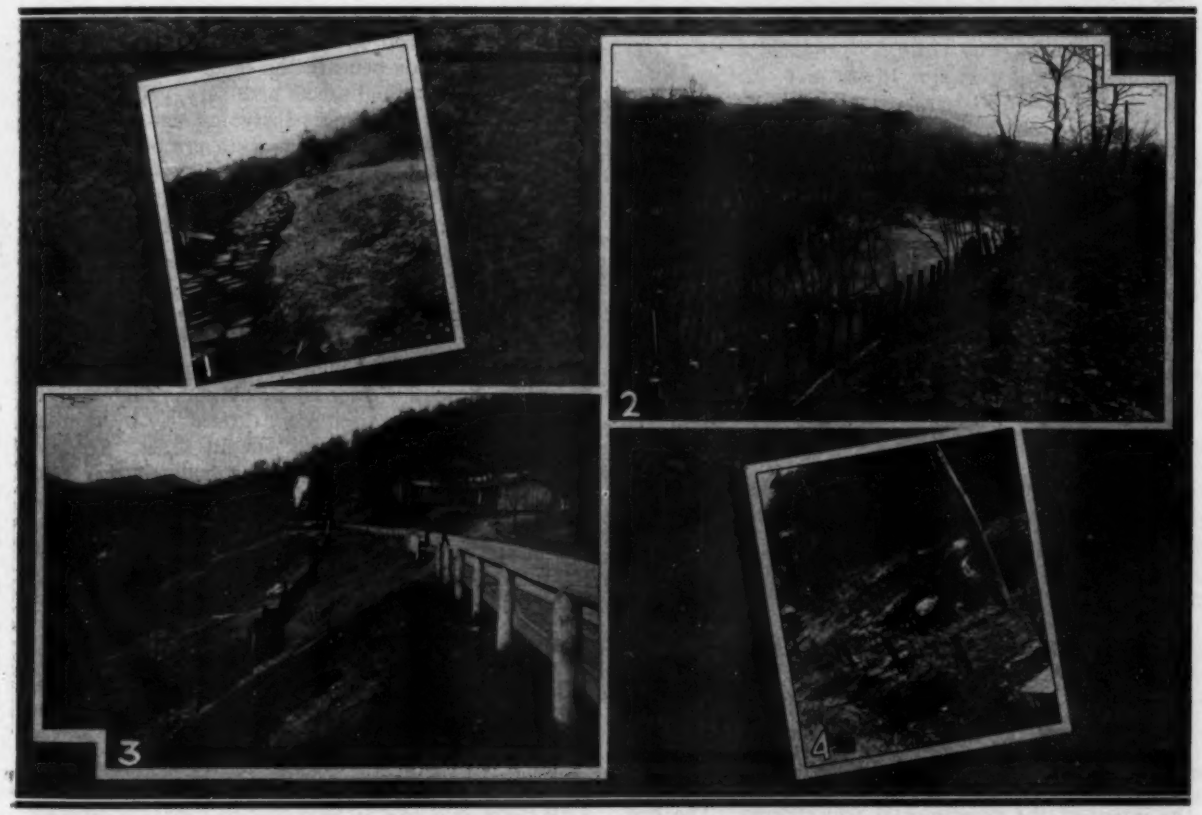
USE OF WOOD PILES HAS DISADVANTAGES

The use of wood piling is very extensive. It may be found in use in attempts—temporarily more or less successful—to hold fills in place and to hold masses that have moved or threatened to move on a road. There are cases where a pavement rests in part upon old slide material and in part upon fill. Often the pavement is threatened with undermining and dislocation, and with being covered by material from above. In such cases piling has been placed at the foot of the fill and at the upper side of the road. As many as five rows may be seen at some points. Occasionally, for a single purpose, as many as three rows are placed. In some cases they are staggered, on 3- to 5-foot centers, with rows 4 feet apart. Frequently the piling is driven as closely together as possible. In the illustration below a row of piling may be seen so massed as to constitute a retaining wall. Oak piling used for this purpose varies from 20 to 30 feet in length. A good and general practice is to drive it to refusal into an underlying

bed of solid shale. Occasionally piles are used wholly in fill material to stiffen the mass, but this practice has not been very successful.

H. J. Spelman, Division Engineer of the West Virginia State Road Commission, has stated that the cost of such piling in his division when done by contract varied from 75 cents to $1 per lineal foot of timber. Many jobs have been reported as having cost approximately 90 cents per lineal foot of timber.

The use of wood piling is believed to have several disadvantages. It is never known in advance whether a single row will prevent the movement of a sliding mass. The sight of old piles either completely overthrown or pointing out from hillsides like cannon is not uncommon. After one row has been put in, if there is evidence of further movement, another row may be added and so on up to a maximum of five. Five rows may cost from $28 to $33 per lineal foot of road. The life of untreated wood piling, and this is almost universally used, is relatively brief. The United States Forest Service estimates it at approximately 8 years.



METHODS OF HOLDING FILL IN PLACE WITH PILING

1. *Closely spaced piling to hold a road in place.* 2. *Casings filled with reinforced concrete used to retain a fill. Oak piling nearer the river has failed and the concrete piling is beginning to fail. Drainage of the swampy area on the other side of the road appears to be the remedy.* 3. *Sheet piling used to hold a fill.* 4. *Steel rails used to hold a slide*

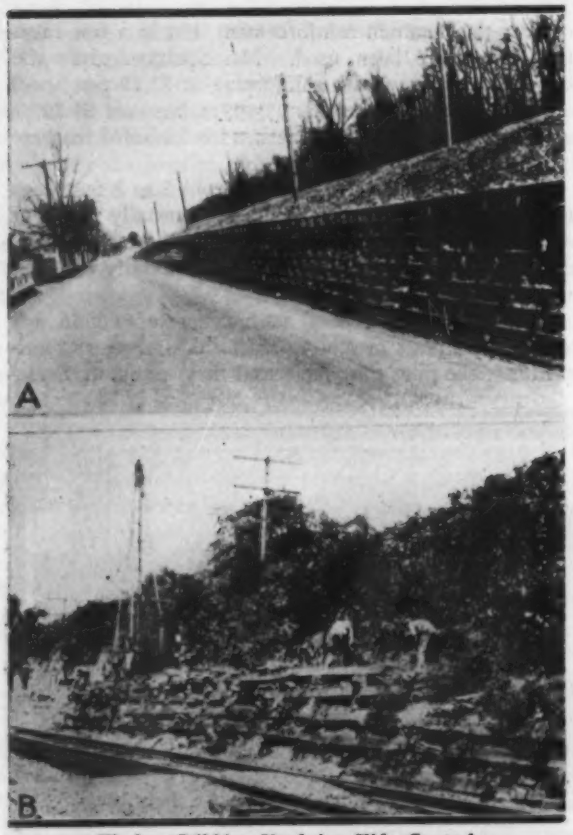
CASINGS FILLED WITH CONCRETE OFTEN USED

The use of piling formed by filling well casings with concrete has increased in popularity and is becoming extensive. The cost in this district is somewhat less than it would be elsewhere as second-hand oil and gas well casings can usually be purchased. The concrete filling is sometimes put in without reinforcing. Steel rods are the common reinforcement, but in a few cases steel rails have been used. Mr. Spelman gives the cost of such casing with reinforcing at $1.11 per lineal foot of casing; but, on many jobs it has cost $1.20 or more per lineal foot. No overhead is included in these figures.

This type of piling is often set from 5 to 8 feet deep in so-called solid material which is usually shale or sandstone. Both this type of piling and hardwood piling are often backed with planking, especially near the top.

The use of casing filled with concrete to hold any considerable mass of sliding material is always experimental. The piles may hold, and they may not. Sometimes rows of piling have gone out, probably because they were placed too near the edge of buried shale or rock which split under pressure.

In West Virginia, at a point known as the Godbey slide, the paved road which was buried is slightly above a small river. A clean-up was made, and to avoid future trouble detritus was removed for a considerable distance beyond the inside shoulder of the road. This cut exposed a vertical face of solid shale 12 or 15 feet in height, evidently made by the river earlier in its history. This condition shows remarkably well how casing might be set near the edge of such a face and result in failure. It is important that the outline of solid material be ascertained before such control methods are undertaken. There are numerous failures



Timber Cribbing Used for Slide Control

where the cause is unknown. Casings may have been set in shale which softened, allowing them to tip over. They may have been bent or broken. It would be worth while to pull a few such piles to get more definite information.

SHEET PILING AND STEEL RAILS USED

Only one case of the use of sheet piling has been observed. On this job the sheet piling appeared to have stabilized the mass above it which was already nearly stable, but it has not prevented high water in the stream below from penetrating the fill, which was the intent of the experimental undertaking. The cost per lineal foot of such piling is intermediate between that of oak and reinforced concrete.

Rows of steel rails have occasionally been used by railroads for the control of slides, and in one or two instances by highway engineers, but not very satisfactorily. A case of such use is illustrated above.

RETAINING WALLS EXTENSIVELY USED

Retaining walls, although relatively expensive, are extensively used, mostly on the lower side of the pavement, but not infrequently above the road and sometimes to protect residential property and cemeteries.

Many cases have been observed where the cost ranged from $35 to $60 per lineal foot and where less expensive protection such as casing filled with concrete would serve as well. Usually proper drainage on the inside of the road and beneath it will be cheaper and more satisfactory in results than a retaining wall.

A strong objection to the relatively expensive retaining wall lies in the uncertainty as to the magnitude of the forces that will act on the wall.

CRIBBING SUCCESSFULLY USED

The use of cribbing at the foot of a slide mass after a steam shovel clean-up is increasing. Cribbing has usually been built of untreated rough oak logs. Lately squared creosoted logs have come into use, and, very recently in Ohio, concrete units have been tried. The initial cost of the two latter types of cribbing is high, but the results obtained are likely to be permanent.

The illustration of cribbing shows a case where the timber has become so rotten as no longer to prevent detrital movement. The old cribbing is being removed and reinforced concrete piling placed in its stead. It is not safe to depend on cribbing to retain an unstable mass which extends beneath the road. In such a case, if a brute-force method seems necessary, cribbing must be supplemented by piling. In typical cases observed, oak cribbing cost $10 and concrete cribbing $38 per lineal foot of road.

BLASTING SELDOM PRODUCES WORTH-WHILE RESULTS

Drilling through slide masses and near the toe of fills which are moving, or in which incipient movement has started, and dynamiting the underlying material is a time-honored method of attempted control. It is often recommended by engineers and in the area under discussion has been resorted to by some highway engineers. It has been used more extensively by railroad engineers in connection with side-fill slides. Some of them have adopted the practice of drilling holes 35 to 55 feet in depth, extending 18 to 25 feet into so-called solid material along the toes of fills. Holes are spaced 20 feet apart, and after springing sometimes twice with 30 to 60 sticks of 40 per cent dynamite loads varying from 300 to 500 pounds of 40 per cent dynamite are shot in them.

There does not appear to be any evidence to justify the use of this method except in special cases. When used it is stated that it is experimental or that it opens up underground drainage and allows water to escape. Again, it is claimed that it roughens the ground beneath the fill and prevents sliding. This theory assumes that a fill slides as a unit on an underlying surface, whereas, in nearly every case, there is movement throughout the mass or, at least, the lower part of it. The movement is a slump rather than a slide.

If drainage channels are opened by blasting, relief is likely to be only temporary, for they will quickly be choked with fill material. In one case investigated holes were drilled to a depth of 17 to 20 feet below the level of an immediately adjacent river and shot. It was stated that the advantage to be obtained was undersurface drainage.

In several instances shale base lying below water level has been heavily blasted. In such cases it is not possible to avoid the belief that the blasted material will rapidly disintegrate into muck. Such practices can only result in very temporary control and must ultimately lead to the destruction of the only basis for rational control methods.

Under special conditions, however, there may be some

advantage in blasting underlying solid sandstone or limestone.

ROCK LOADS OF LITTLE VALUE IN PREVENTING SLIDE

Several cases have been observed where large boulders were placed at random on the outside of side fills. Usually the boulders so placed gradually work to the toe of the fill. In a number of cases masses of boulders have been assembled originally at the toe of a fill.

Boulders distributed over a fill, apparently with the idea of holding the fill down by load, add nothing to the cohesive strength of the mass; they simply add further to the load, which is already too great. Boulders massed along the toe of a fill probably do exert some retaining effect, but on the whole their use is of little value.

DRAINAGE BELIEVED TO BE SOLUTION OF PROBLEM

The most important conclusion resulting from the study of slides in this district is that, generally speaking, preventive measures should be substituted for retaining structures. Usually a certain load is unavoidable. The nature of the detrital material is such that it is unstable when wet, the tendency toward instability dependiing on the fineness of the material and the clay content. The normal load and nature of the material can not generally be changed, but it is usually possible to eliminate the third factor causing slides, namely, water. It is not necessary to eliminate all moisture, but the content must be kept below the critical point at which it makes the mass unstable.

This may be done, according to the nature of the problem, by surface protection from penetration by rainfall, by surface drainage, or by underground drainage which reaches the source of seepage or flow. Side fills and through fills can be protected from penetration by rainfall where necessary. It is also possible to isolate them from underground water in most cases. Masses of overhanging detritus can generally be sufficiently drained to prevent movement.

Only sporadic attempts at drainage control have been made. A case at Morgantown, W. Va., has been described where drainage of underlying shale solved a serious problem. Small-size, open-joint tile has been occasionally used in soft spots in a road and French drains have been placed beneath inside ditches. Some surface drainage has been undertaken for the purpose of removing water from pockets of overhanging, old-slide detritus. Such work, however, has been neither systematic nor thorough. Lack of emphasis on prevention is common to most human experience, and we spend money on landslides largely after they have occurred.

It is believed that this district needs more trenching machines, and fewer steam shovels and piles; that drainage will be found to be cheaper and more permanent than any control method now employed; and that it must be undertaken with knowledge of local geological conditions. Detrital areas which are traversed by roads must be studied from a geological standpoint. Water seepage must be traced to its source, and water volume determined following rainfalls of varying intensity. Test holes or other means of interior exploration will answer this purpose.

If detrital material has been undisturbed for a considerable time, fine clay may have been washed downwards and accumulated below as in the formation of subsoils. Therefore, where slide material has been at rest for some time, the greater part of the underground water will be found comparatively near the surface, that is within 3 to 5 feet of it. In one case observed after a heavy rainfall, where a cut had been made in a thick mass of detritus, water was escaping in almost a solid sheet, along a plane about 5 feet below the top of the cut.

Before fills are placed it is vitally important to observe whether the location is on ground which is wet not only during but for some time after rains. When wet spots are found, the source of the moisture must be located. Frequently it is in detritus on the hillside and after a fill is placed water enters from the side or end contact. The use of wet materials in building a fill, especially at or near its base, has been demonstrated to be a dangerous practice.

Most sidehill failures can be prevented by drainage on the inside of the road, or, better, by drainage installed before the road is graded.

The annual damage resulting from the slides and subsidence is so enormous that systematic preventive experiments and study of relative costs and permanency of results is obviously justified.

It is believed that the solution of a very large proportion of the cases which arise, and this includes evidence of danger as well as slide movement, lies in the direction of drainage.

Oxy-Acetylene Welding in the Structural Field

IN the fabrication of structural steel, welding has advanced well beyond expectations. From the start the advocates of structural welding which not only includes the welding of structural building steel, but rolled steel products for structures of all classes, have aimed high and the activities in this field of welding in jobs accomplished and in immediate contemplation stand to attest the soundness of their judgment, according to the report of the Oxy-Acetylene Committee, International Acetylene Association.

While many of the details of the earlier determinations in structural welding design have been improved upon or modified by the more recent experience, none of these applications have developed structural deficiencies. To date, with nearly a hundred major applications there is yet to be reported a failure.

The significance that can be ascribed to this record is none other than that sound welding intelligence guided this entire development. The welding industry has learned that each case of welding requires a specific procedure control and when such is followed the results are invariably satisfactory. This knowledge was available when the welding of structural steel was embraced. Extensive supplementary experimental tests were conducted, however, to verify the then-existing data before any major commercial structures were held fabricated. Many of these experimental tests were in full size scale and included columns and beam connections, built-up girders and roof trusses. These preliminary test results provided a groundwork of proof of feasibility for structural welding which, coupled with the results of applied cases, are responsible for the present wide interests and scope of this welding application.

Hand in hand with the development of welding of structural steel framing for building has been the gradual conversion of iron and steel castings to welded rolled steel materials.

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Most of These Officials May Be Seen at the Cleveland Road Show January 14-18

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J. E. Core, Sales Manager, Jackson Manufacturing Co., Harrisburg, Pa.

A. C. Picard, General Manager, Lubricator Div., McCord Radiator & Mfg. Co., Detroit, Mich.

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R. T. Beebe, President, Beebe Bros., Seattle, Wash.

Frank H. Dewey, General Manager, Wood Hydraulic Hoist and Body Co., Detroit, Mich.

B. J. Hunt, Sales Manager, Wiard Plow Co., Batavia, N. Y.

F. L. Averill, Manager, Southern Sales, Wiard Plow Co., Batavia, N. Y.

A. P. Robinson, Sales Manager, Ransome Concrete Machinery Co., Dunellen, N. J.

Jack Trevor, Ransome Concrete Machinery Co., Dunellen, N. J.

Howard O. McMillan, President, M. & M. Wire Clamp Co., Minneapolis, Minn.

W. A. Gordon, Sales Manager, General Wheelbarrow Co., Cleveland, Ohio

J. Otis Pierce, Sales Manager, Brown-Lipe Gear Co., Syracuse, N. Y.

Arnold Nelson, Sales Manager, N. P. Nelson Iron Works, Passaic, N. J.

Harry L. Horning, President, Waukesha Motor Co., Waukesha, Wisc.

Lorimer Dunlevy, General Sales Manager, O. B. Szekely Corp., Holland, Mich.

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B. C. Briody, Vice President & Manager, Highway Division, Truscon Steel Co., Youngstown, Ohio

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W. J. Savage, Vice President and Sales Manager, Heltzel Steel Form & Iron Co., Warren, Ohio

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G. D. Pinney, Sales Manager, Grader Dept., Rome Mfg. Co., Rome, N. Y.

J. M. Patterson, General Manager, Grader Dept., Rome Manufacturing Co., Rome, N. Y.

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S. E. Barlow, President, Huber Manufacturing Co., Marion, Ohio

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Louis J. Rogers, Vice President, Rogers Bros. Corp., Albion, Pa.

Charles A. Rogers, President, Rogers Bros. Corp., Albion, Pa.

H. F. Kanauer, Sales Manager, Commercial Division, Highway Trailer Co., Edgerton, Wisc.

C. E. Messinger, President, Chain Belt Co., Milwaukee, Wis.

H. D. Van Doorn, Assistant Manager, Treckson Co., Milwaukee, Wis.

Ernest Schaefer, Secretary and Sales Manager, The Gustav Schaefer Co., Cleveland, Ohio

A. R. Ellis, General Manager, Pittsburgh Testing Laboratory, Pittsburgh, Pa.

A. C. Vicary, Vice President, Bucyrus-Erie Co., Erie, Pa.

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Howard E. Sneathen, Director of Commercial Car & Truck Sales, Dodge Brothers Corp., Detroit, Mich.

W. S. Miller, Secretary & Sales Manager, Hardsocg Wonder Drill Co., Ottumwa, Iowa

B. L. Boye, Standard Oil Co. of N. Y., New York

Oliver F. Binderle, President-General Manager, Brown Clutch Co., Sandusky, Ohio

William I. Buhl, President, The Buhl Co., Chicago, Ill.

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F. H. Edson, Sales Manager, The John Lauson Manufacturing Co., New Holstein, Wis.

W. R. Meadows, President, W. R. Meadows, Inc., Elgin, Ill.

J. P. Gilson, President, Kwik-Mix Concrete Mixer Co., Port Washington, Wis.

Arthur S. Hughes, President, The Hughes Keenan Co., Mansfield, Ohio

A. B. Shufeldt, General Manager, Universal Road Machinery Co., Kingston, N. Y.

Harris & Ewing
D. C. Fenner, Manager, Public Works Dept., Mack Trucks, Inc., New York City

W. R. Barbour, Sales Manager, Domestic Engine & Pump Co., Shippensburg, Pa.

H. C. Beckwith, President and General Manager, Byers Machine Co., Ravenna, Ohio

Ed. Walsh, President, Superior Body Corp., Marion, Ind.

Wm. H. Hassenplug, Manager, Excavator Sales Department, Harnischfeger Corp., Milwaukee, Wis.

J. R. Wemlinger, President, Wemlinger, Inc., New York, N. Y.

R. J. Bernholdt, The Leach Co., Oshkosh, Wis.

D. J. Conway, Eastern Sales Mgr., Leach Co., Oshkosh, Wis.

E. C. Leach, President, Leach Co., Oshkosh, Wis.

C. J. Hug, President, The Hug Co., Highland, Ill.

Earl D. Stearns, Vice President, Fairfield Engineering Co., Marion, Ohio

F. A. Orten, Vice President & Sales Manager, Orten Crane & Shovel Co., Chicago, Ill.

L. W. Glaser, Sales Manager, Littleford Bros., Cincinnati, O.

Roger S. Littleford, Littleford Bros., Cincinnati, Ohio

Theo. Hansu, National Hoisting Engine Co., Harrison, N. J.

Gus H. Olsen, Manager, Crane & Shovel Dept., Link Belt Co., Chicago, Ill.

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J. S. Helm, President, The Asphalt Assn., New York, N. Y.

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J. E. Pennybacker, Secretary & General Manager, The Asphalt Assn., New York, N. Y.

W. H. Stiemke, General Manager, Trackson Co., Milwaukee, Wisc.

L. E. Dauer, Sales Manager, Trackson Co., Milwaukee, Wisc.

G. B. Harris, General Manager, The Miami Trailer Scraper Co., Troy, Ohio

E. T. Smith, Sales Manager, The Miami Trailer Scraper Co., Troy, Ohio

Frank F. Hase, President, C. H. & E. Manufacturing Co., Inc., Milwaukee, Wisc.

Wm. W. Schneller, Sales Promotion Dept., C. H. & E. Manufacturing Co., Inc., Milwaukee, Wisc.

C. A. Luster, President, Clyde Iron Works Sales Co., Duluth, Minn.

J. T. Frost, General Sales Manager, Clyde Iron Works Sales Co., Duluth, Minn.

Henry H. Schramm, President, Schramm, Inc., West Chester, Pa.

A. O. Witt, Manager, Sales Promotion, Schramm, Inc., West Chester, Pa.

Shelby E. Race, Sales Manager, Lansing Co., Lansing, Mich.

W. S. Hovey, President, Fairbanks, Morse & Co., Chicago, Ill.

G. K. Specht, Vice President, Hercules Products, Inc., Evansville, Ind.

M. J. Saagen, President, Saagen Derrick Co., Chicago, Ill.

H. C. Merritt, Manager, Monarch Tractors Division, Allis-Chalmers Mfg. Co., Springfield, Ill.

Robert W. Gotshall, Sales Manager, Monarch Tractors Div., Allis-Chalmers Mfg. Co., Springfield, Ill.

An Efficient Floating Concreting Plant

Well-Chosen Equipment Assembled Effectively By Merritt-Chapman & Scott Corporation For Baltimore Harbor Terminal

THE City of Baltimore is building a large harbor terminal at Locust Point in Baltimore Harbor which will cost more than $6,000,000. An idea of the size of the project may be secured from the fact that it involves driving 50,000 piles from 35 to 90 feet long. Upon completion the plant is to be leased by the city to the Western Maryland Railroad.

The Merritt-Chapman & Scott Corp., is building one of the piers in which most of the piles driven are about 90 feet long. The concrete is now being placed in the outside walls, center walls and column pedestals. A very efficient concreting plant has been developed by the contractor for this work. As the pier is surrounded on three sides by water, the plant is mounted on barges and consists of a mixing and placing barge on which is mounted a one-yard stationary drum mixer, a batching plant, cement shed, cement elevator to the mixer loading platform and a portable belt conveyor for placing the concrete.

The mixer is mounted high enough to discharge into a concrete hopper above the belt conveyor, so as to control the flow of concrete onto the belt. The loading platform is placed at a convenient height for emptying cement bags into the mixer loading hopper and the measuring hoppers of the batching plant discharge direct into the loading hopper of the mixer. Cement is wheeled from the cement house to the foot of the Haiss cement bag elevator and carried by hand to the loading hopper from the head of the elevator.

Sand and gravel are delivered alongside in divided barges which are constantly kept at hand as the storage capacity of the batching plant is merely enough for one hour's run.

A derrick barge equipped with a clamshell bucket places the sand and gravel into the batching plant and is available for warping the concreting barge along the pier.

The belt conveyor is a standard Haiss portable troughed type from which the wheels and carriage have been removed and which is carried by chain blocks from an A-frame at the side of the barge. It is driven by a 2-cylinder LeRoi engine mounted over the elevator frame. A scraper of rubber belting is placed normal to the conveyor belt just above the head pulley. The flashing at the loading end has been made higher and a couple of holes put in the frame at the loading end to facilitate hosing the belt and pulley.

The concrete is made to strict specifications which call for 1½ minutes in the drum. A batch of ⅞ to 1 yard is turned out every two minutes. The conveyor handles each batch in from 35 to 50 seconds. Because the hopper is between the mixer and the belt there is no delay in the cycle of mixer operations. The concrete has a sticky consistency, dry enough to meet the approval of the engineers and wet enough to flow around the reinforcing steel and be easily spaded. In order to prevent segregation caused by falling on the reinforcement, the concrete is discharged at the head of the conveyor into a tremie suspended from the frame.

Concrete has been carried up slopes as steep as 30 degrees without any decrease in capacity or increase in spillage. After placing 4,000 yards with no repairs or replacements, there was no apparent wear. The entire conveyor and belt are thoroughly hosed down at least twice a day.

A. S. Covell, Superintendent for Merritt-Chapman & Scott Corp., who designed the concreting layout, reports that the only change he would make in redesign would be to use a 20-inch belt instead of a 16-inch belt to increase the margin of the belt against spillage.

This is considered a very efficient plant from the standpoint of equipment and labor, using one man on the gravel barge, two men handling cement, the crane man, the mixer operator, one man at the concrete hopper and one man cleaning up. This constitutes the crew afloat. Ashore, there are two men at the conveyor, and one man spading the forms. The output averages 200 yards per 8-hour day.

The Floating Concreting Plant Used at Baltimore, Showing Concrete Sack Elevator, Blaw-Knox Bin, Conveyor Delivering Mixed Concrete to Portable Hopper and Concrete Buggies Used to Deliver Batches to the Pier Walls

Welding Materials

IRON and steel remain the outstanding fabricating materials, and welding materials that apply to these metals are in the majority. It is not very long ago that these were the only metals other than cast iron that could be commercially welded. A man who could weld manganese steel or aluminum was considered a past master of the art. Today every known commercially used metal is welded by the oxy-acetylene process and there is a suitable welding metal for each, according to the report of the Oxy-Acetylene Committee of the International Acetylene Association Alloy steel, stainless steel, acid-resisting iron, corrosion-resisting bronze, aluminum, manganese steel, monel metal, Stellite, copper and bronze mixtures of every nature, are being welded successfully.

Successful welding of any metal depends on procedure, skill, equipment and the welding material. A resumé published by the International Acetylene Association lists only the available welding materials for the various metals. For some metals cast rods are used in combination with or without a flux, others require drawn wires or rods and no flux, depending upon the nature of the metal and the conditions surrounding the application. Fluxes are not always used by extra skilled welders, but where recommended by authorities they should be used to secure uniformly satisfactory results.

The following list of metals, together with welding materials or filler materials that apply to them as determined from successful commercial application either in the welding together or the building up of metals as the method applies:

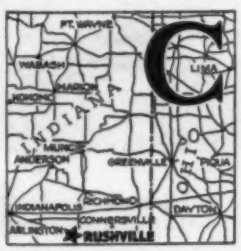
Metal	Welding Metal
Aluminum—	
Castings	Cast;Aluminum Bars of same analysis, sizes 3/16, ¼, 5/16 — 12 to 20" lengths
Sheet	Pure Aluminum Wire of same analysis, sizes 1/16, ⅛, ¼ coils — 36" lengths
Brass (Sheet and Castings)	Tobin or Manganese Bronze Rods, sizes ⅛, 3/16, ¼ — 36" lengths
Bronze	Manganese Bronze Rods, sizes ⅛, 3/16, ¼ — 36" lengths
Copper	Tobin or Manganese Bronze Rods, sizes ⅛, 3/16, ¼ — 36" lengths Copper Wire, sizes ⅛, ¼ in coils.
Cast Iron	Cast;Iron Bars, sizes 3/16, ¼, ⅜, ½, 12 to 24" lengths Tobin or Manganese Bronze, sizes ⅛, 3/16, ¼ — 36" lengths
Chrome-Nickel Steel	Chrome-Nickel Steel Rods, sizes ¼ — 12" lengths
Duraluminum	Pure Aluminum Wire, sizes ⅛, 3/16, ¼ — 12" lengths
Duriron	Cast Duriron Bars, sizes ¼ — 12" lengths
Everdur	Everdur Cas tBars or Wire, sizes 3/16, ¼ — 12" lengths
Gray Iron	Same as Cast Iron.
High Carbon Steel	Special H.C. Rods or Wire, sizes 3/16, ¼ — 36" lengths Nickel Steel Rods, sizes ⅛, 3/16, ¼ — 36" lengths
Iron	See Steel.
Lead	Pure Lead Wire, size ⅛, in coils.
Malleable Iron	Tobin or Manganese Bronze rods, sizes ⅛, 3/16, ¼ — 36" lengths
Manganese Steel	Manganese Steel Wire, sizes ⅛, 3/16, ¼ — 36" lengths
Monel Metal	Monel Metal Wire, sizes ⅛, 3/16 — 36" lengths
Molybdenum Steel	Same as used for regular low and medium Carbon Steels.
Chrome;Iron Alloys (such as Stainless Iron and Steel)	Cast Bars or Wire of same analysis, size ¼ — 12" lengths
Steel*	Low Carbon Steel Wire, sizes 1/16, 3/32, ⅛, 3/16, ¼, 5/16, in 36" lengths or coils, usually copper coated; Special Rods are also available for special purposes.
Stellite	Stellite Cast Bars, sizes ¼ — 12" lengths
Vanadium Steel	Vanadium Steel Wire, size ¼ — 36" lengths
Wrought Iron	Same as Low Carbon Steel.
Nickel Steels	Nickel Steel Wire, sizes ⅛, 3/16, ¼ — 36" lengths

*Standard analysis such as tank, plate, fire box steel, structural steel, boiler plate, tubing, etc.

A Water Problem—Too Much and Too Little

By Ulrey Dorman,

State Highway Department, Rushville, Indiana



CONSTRUCTION work on Brookville Pike, state road No. 52, between Indianapolis, Indiana, and Cincinnati, Ohio, known as Federal Aid Project No. 120, Section A, began on April 30, 1928, by J. M. Robertson and Sons, Terre Haute, Indiana. The project started 4½ miles southeast of Rushville, Indiana, at the end of the concrete pavement built by Rush County in 1917. The project runs in a southeasterly direction 8.82 miles through the towns of New Salem and Andersonville. The alignment of construction followed the old stone road, except where curves were lengthened.

The contractor began grading, using two 10-ton Caterpillar tractors and rooter for tearing up the old road bed, and an Adams Road King grader with a tractor for spreading out the old metal of the road before any fills were made. All fills were torn up and spread out to the required width of the new grade. Dirt was removed from the cuts by a Caterpillar tractor drawing four 1¼-yard Maneys. The fills were rolled as built up in 12-24-inch layers with a 10-ton Huber steam roller. Balance points were from 800 to 1,400 feet apart. There were approximately 28,000 cubic yards of Class A excavation on the project. Teams were used on light work with short hauls.

Drainage Structures

Structural work was begun at the time the grade work was started. There were 4,500 feet from the point where grading began to the first structure to be built. This gave the structure crew time to keep ahead of the grading. There were thirty-six structures to be built, consisting of reinforced concrete pipes of 15-, 18-, and 24-inch diameter. Box culverts were 3 feet x 3 feet and all back fills were puddled. The crew on structures consisted of one foreman and from four to eight men using a one-bag Jaeger mixer. All head walls to the pipe structures were poured after the pavement was laid.

Final Grade and Form Setting

Approximately 2,400 feet of Blaw-Knox forms were used, giving 1,200 feet to each side. This gave the form setters time to keep the forms to true grade and line. After the forms were set they were checked at joints with a straight edge.

Grade stakes were set on each side of the road, on a 2-foot offset, giving ample room for working the form

line with a tractor and small grader, if necessary.

After the forms were set, the contractor used a Lakewood sub-grader pulled by a 5-ton Cletrac tractor and rolled with a 5-ton Fordson roller with concrete-filled wheels, 2 to 4 teams being used for moving surplus dirt to low spots or moving it outside the form line.

CENTRAL PROPORTIONING PLANT

Sand and gravel were obtained from the Granite Sand & Gravel Co., Morristown, Indiana, making a haul of 16 miles. The material was delivered at the plant in Rushville by traction line, using dump cars holding 12 to 20 yards per car. The cars dumped into pits, dug alongside the track, and the aggregate was removed by an Erie steam crane and clam shell to the storage pit or bins. The bins were so located that the clam shell could operate from the pits without moving. The bin was built with a partition separating the sand and gravel and so constructed that trucks could drive under it for loading. Johnson batch weighing hoppers were used for both sand and gravel, one man operating both hoppers from the platform.

HAULING BATCHES AND CEMENT

Handling material was quite an item on this project, as there was a 13½-mile haul from the loading plant in Rushville to where the mixer started pouring. Trucks had to haul over rough grade as it was built, and the grade had to be kept in shape that the trucks might make time in hauling.

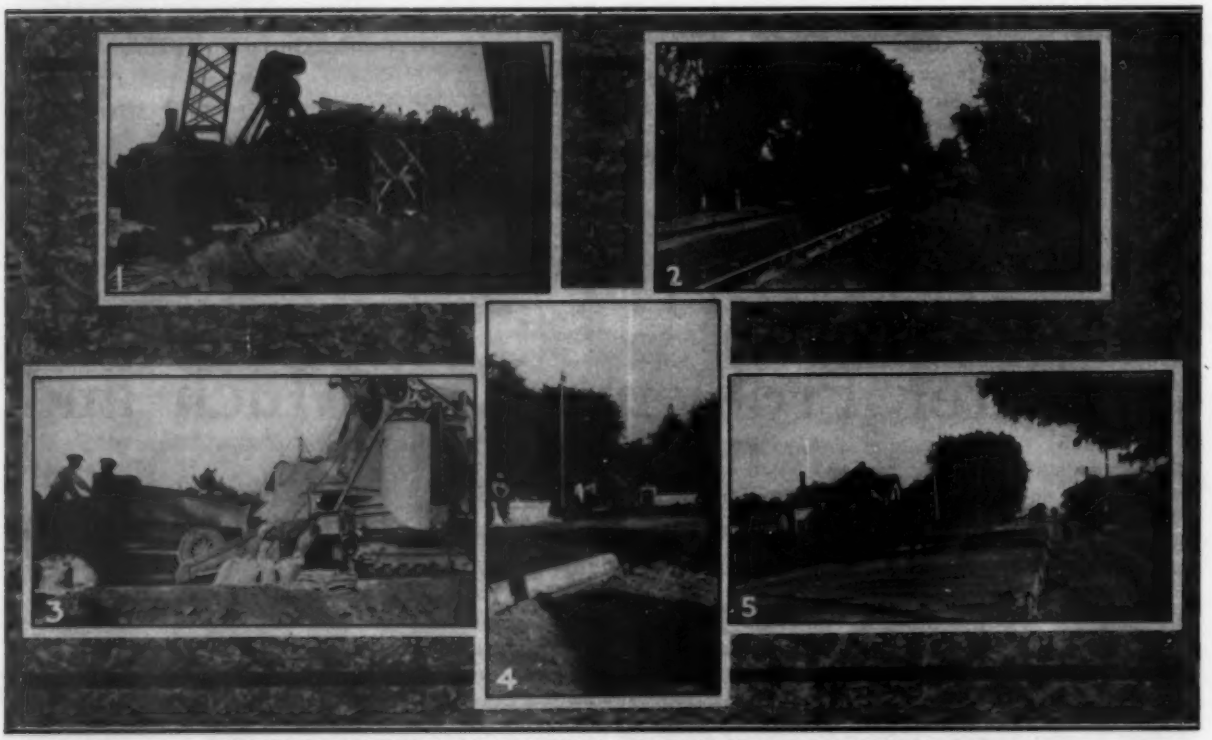
The contractor used 15 International trucks, hauling two batches to a truck; and 40 rented trucks hauling one batch to a truck. The hired trucks were laid off as the haul decreased. Cement was hauled on separate trucks with flat beds, hauling from 40 to 80 bags to a load. As the cement was hauled out it was placed on both sides of the grade, just inside of the forms, three bags being set together. This method was used so as to get the required amount into each batch, as 2 men were used to dump the cement into the skip after the batch was dumped from the truck, each man dumping three bags from his side of the skip. Cement was delivered to the plant at Rushville by the traction line.

CONCRETING

The contractor started laying pavement May 22, beginning at the extreme end of the project and working toward Rushville, where the proportioning plant was located. A 27-E Rex mixer was used with a 6-bag batch and a 1:2:3 mix.

Finishing was done with an Ord finisher, with a belting machine behind. The belter was operated by two men, who also did the hand finishing and placed burlap on the pavement as soon as possible without marring the pavement, and sprinkled it to keep the burlap wet.

After the pavement was set up, on the morning after a day's run it was gone over with a 10-foot straight edge and all variations were hand-rubbed. Straw 3 inches deep was then placed on the pavement and sprinkled. The pavement was kept wet for 14 days and



ACTIVITIES ON THE J. M. ROBERTSON & SONS JOB AT RUSHVILLE, IND.

1. Erie crane with clam shell handling sand from stockpile to bins. 2. Form line and subgrading in New Salem. 3. A 1-batch truck delivering proportioned aggregate to skip of Rex paver. Cement bags stacked at side. 4. Ord finisher working on slab over a culvert. 5. Four-wheel burlap carrier riding on forms

opened in 17 days, or longer if more time was required for removing the straw. The straw was then rebailed and hauled ahead to use again.

The pavement was 18 feet in width, with a 7-inch center and a 9-inch side, with a 2-inch crown at the center. A Kalman center strip was used of 16-gage in 10-foot lengths, with a 4-foot dowel bar through the center strip every 5 feet. Three-quarter inch side rods set on chairs 6 inches inside of the forms were used, the rods being painted. The forms were oiled after being set and before any concrete was placed.

The pavement was straightened after the straw was removed, using a 10-foot straight edge. All variations of ¼ inch or more were painted and the station number recorded. These variations were ground down by using a Berg grinding machine, with two men operating the machine. The pouring of concrete was completed September 28, 1928, and the pavement opened to traffic October 20, 1928.

THE WATER PROBLEM

During the month of June, which was very wet, the mixer operated only 12 days, laying 6,477 lineal feet. During the month of July, the mixer operated 23 days, laying 14,116 lineal feet, or 614 lineal feet per day the mixer operated.

Water was pumped to the mixer through 2-inch pipe line. When the mixer was over a mile from the main pump, a booster pump was put on. The first pumped into a large tank and the booster pumped to the mixer and on back to the sprinkling hose for curing the pavement. This method insured sufficient pressure at the mixer and sprinkling hose.

During the first part of August insufficient water supply became quite a problem, as small streams went dry. The contractor tried using wells, which process was successful for about a 5-hour run only, when the mixer would have to be shut down. Subsequently, the contractor put in a pipe line to Little Flat Rock Creek, making a pump of 17,000 feet, using the booster pump approximately 3,000 feet ahead of the mixer. To insure pressure at the mixer and the sprinkling hose back of the mixer, the booster pump was moved ahead as work progressed.

From August 1 to August 13, before the pipe line was laid to Flat Rock Creek, the mixer operated only 7 days, laying 3,680 lineal feet; from August 16 to September 1, the mixer operated 14 days, laying 8,309 lineal feet, or an average of 593 lineal feet per day that the mixer operated.

REPAIR SHOP

The contractor had a repair shop at the plant, employing from 2 to 3 mechanics. One kept the equipment at the mixer and on the grade in operation. The other repaired the trucks, taking care of tire trouble on the road and repaired equipment that could not be cared for on the road. There was a gas tank at the repair plant, one man taking care of both gas and oil. Rented trucks could obtain gas and oil at the plant.

SHOULDERS AND DITCHES

The building of the shoulders and side ditches began as soon as a mile or more had been cured the required 17 days, using a 10-ton Caterpillar tractor and an Adams grader for cutting the side ditches and grading the dirt up into place. Five to eight teams were used for hauling dirt on short hauls along the shoulders. Practically all the project was worked by this method.

On two or three long hauls dump trucks were used. The crew working on the shoulders and ditches consisted of 2 foremen and 15 men. A 6-foot shoulder was built, using a string line and hand finishing. All the shoulders were rolled with the 5-ton Fordson roller.

PERSONNEL

This project was a state highway built under the direction of the Indiana State Highway Commission with Ulrey Dorman as Project Engineer and P. L. Parker, Field Engineer. J. M. Robertson is President of J. M. Robertson & Sons, Terre Haute, Indiana, and J. R. Robertson is Superintendent.

An Unusual Piece of Excavation

WHEN it became necessary to lower the floor level of Dodge Brothers' new machine shop about 3½ feet, a contract was let to Gallagher & Fleming, Detroit, Mich. The excavation was sublet to Rocque & Gibbs, whose contract called for lowering the floor level and removing 2 to 3 feet of clay which was covered with a concrete floor. Because of the low overhead clearance and the fact that the work was inside of the building, it was impossible to get a standard shovel on this job and it was either a question of using hand labor or a small excavator.

A Bay City tractor shovel was used continuously 24 hours a day in three shifts and run for more than 80 hours without stopping the motor, when the work was temporarily shut

Lowering a Floor Level with Small Excavator After a Steel Garage Has Been Completed

down for a few hours because of the breaking of a gas main. Work was resumed and a second Bay City tractor shovel added. Nineteen trucks were used to haul the material away from the machine. Four of the trucks were of 3-yard capacity and 15 of 2-yard capacity.

A crew of 30 laborers working with air hammers broke up the concrete floor so as to make the loading easier and faster. The break-up crew worked in two shifts, but still were unable to keep ahead of the two shovels. The shovels started digging at 6 in the morning and would catch up with the laborers about 10:30 in the evening. The shovels were then shut down and the air hammers kept on through the full 24 hours.

Cutting the Cost of Shallow Trench Excavation

By Daniel J. Hauer

THE difference in cost between machine work and hand excavation is well understood today and few arguments are necessary in favor of machines, especially for fair-sized jobs. For small jobs, however, the tendency is still to use hand methods. This is true for excavation more than for any other classes of construction. The very day this article was written, the author watched a small crew of men, eight men and a foreman, excavating a shallow trench and backfilling it by hand for a water pipe. Upon inquiry, it was found that in all about 1,300 linear feet of trench had to be dug.

"Too small a job for anything but men. I can have it done before you could get a machine on the job," said the contractor. This remark was made in spite of the fact that no one had mentioned a machine or had offered any criticism of the methods used, evidently showing that even the contractor felt that he was not doing right by using men. In four days his crew had excavated about 350 feet of trench. The pipe had still to be laid and the trench back-filled.

The contractor was both right and wrong. He was right in feeling guilty for using the wrong method, wrong in not using other than hand methods. The job was too small for a regular trenching machine, but it was large enough to use a tractor with ditching equipment or a tractor and dragline scraper and cable.

Typical Example

A contractor and builder recently put up two two-family houses near 238th Street just west of Kingsbridge Road in the Bronx, New York. The builder had to carry a 15-inch terra cotta pipe from his buildings to the nearest sewer manhole, a distance of about 215 feet. The average depth of the trench was to be about 10 feet, starting at 9 feet and running to 11 feet. The builder considered doing the work by hand and also having a contractor excavate and lay the pipe. The costs were estimated about the same. He then decided to hire a Fordson tractor with an operator. He used a No. 3 drag scraper which had been bought for his cellar excavation and a ¾-inch wire cable 60 feet long and one man to operate the scraper.

The ground to be excavated had been filled in about 10 years and was mostly ashes and clay. This was fortunate as the sides stood up without the aid of shoring. The spot was originally a tide water marsh, but no water was encountered as the fill was of greater depth than the excavation.

A 40- to 45-foot stretch of the trench was excavated at one time. The work began at the building line and the trench was excavated to the center of the street where a 90-degree turn was made. It was not possible to excavate in the trench with the scraper next to the building, but all that could be excavated by the scraper was done and, the rest, about one cubic yard, was thrown out by hand.

The Fordson made a straight drag, piling all the excavated material ahead of the open trench and not on the side. When the proper grade was reached the drag scraper man laid the pipe in the trench and the backfilling was done by the Fordson, simply reversing the excavating operations. Then a new section was started and the entire operation repeated. The work was done in five sections.

When the manhole was reached another cubic yard had to be shoveled by hand. The job was started on Monday morning and continued throughout the week, being finished by noon on Saturday. The connection was made with the concrete and brick manhole at that time.

Figure Your Costs

What did the trench excavation and backfilling cost? The builder stated he saved 40 per cent of the estimated hand cost. The Fordson tractor was hired for 5½ days and included the operator, gas and oil. The other workman was also employed for the same length of time. No matter whether you are located north, south, east or west, apply your own costs for hiring such a machine and one man and include an allowance for the scraper and cable and you can figure your own costs. Many a contractor can save money by devising similar methods for doing small jobs instead of using obsolete hand methods.

A Hard Bid—A Foolish Bid

CONTRACTORS in the Central States are frequently heard to say that they made a "hard bid" on a certain job. Just exactly what is meant by bidding hard? The statement means, of course, that all costs are included, and that every cost is exactly the true cost of that portion of the work. To these costs should be added the correct amount for overhead and general expense, including the proper cost of incidentals and profits. The thing which determines whether or not it is a hard bid is whether or not the amount of profits figured has been a very small amount. As a matter of fact, many contractors, particularly those who do not know their true costs in making what they call a hard bid, include as the cost of various items a less amount than they usually figure. For example, a contractor who has a vague idea and usually figures that form work on a certain class of concrete construction costs $4.50 per cubic yard when he comes to making what he calls a hard bid, says to himself, "Now I have got to bid this hard, and I am going to figure that form work costs only $4 per cubic yard." This sort of figuring results in what he calls a hard bid. There is nothing hard about it, it is simply a foolish bid.

Concrete Jetty Construction at Newkirk, Okla.

By Clare R. Van Orman

Assistant Chief Engineer, Smith Concrete Jetty Co., Topeka, Kansas

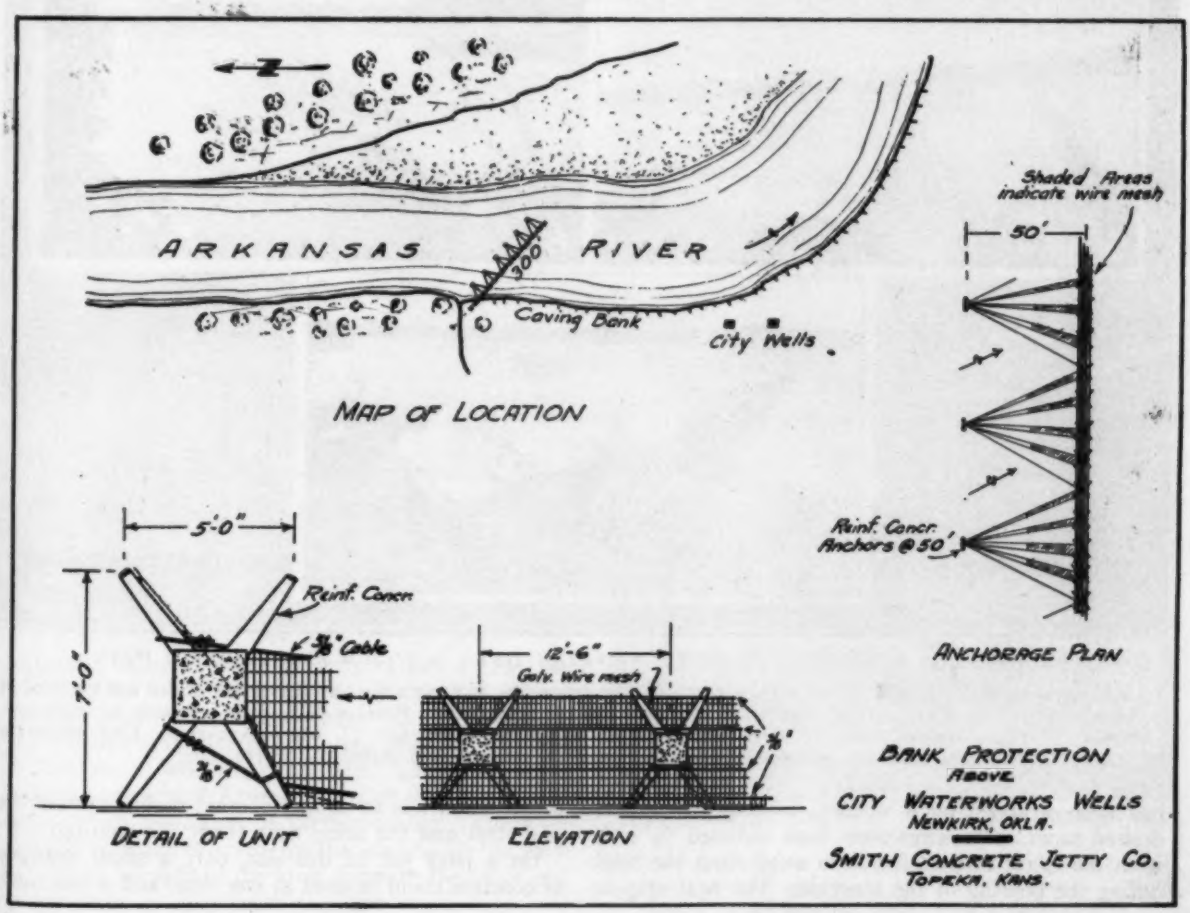
A GLANCE at the map below will show why the Newkirk Water Commissioner was worried. The city of Newkirk depended upon two wells to furnish all the city water. These wells were located 5 miles east of the town, on the Arkansas River. An inspection trip in July, 1927, had revealed the fact that the river was rapidly cutting a deep channel toward the source of the city's water supply. A scant 200 feet of sandy soil remained between the wells and the river bank.

The city commissioners consulted with the Smith Concrete Jetty Co., of Topeka, Kansas. A survey was made of the river location and it was decided to install a 300-foot concrete diversion jetty about 700 feet above the wells. This method of protection was adopted with the idea of turning the main river channel entirely away from the caving bank, thus making the protection permanent.

The work was started November 15, 1927, and was installed complete in 17 working days. Because of the danger of cold weather and the necessity of handling the jetty units soon after completion, a quick setting cement was chosen for the work. This was furnished by the Ash Grove Lime & Cement Co., and was known as Quikard.

The Jetty Unit

The jetty unit is composed of a central mass of concrete from which radiate 8 reinforced concrete arms extending along the 4 diagonals of a rectangular prism. The arms are poured first and later assembled and the center block poured around them. Consequently the first day's work was steel tying. The reinforcing steel for one arm consisted of four ¾-inch round rods, two 4 feet 8 inches long and two 6 feet long. These were equally spaced inside a spiral of No. 6 wire, which



PROGRESS OF THE CONCRETE JETTY, NEWKIRK, OKLA., WHICH WAS BUILT IN 17 DAYS

1. Steel for arms with Ruberoid forms in place ready to pour concrete. 2. Arms assembled before the center was enclosed in a concrete block. 3. River anchors with earth used for form for concrete. 4. Pontoon barge built especially for jetty construction. 5. The completed jetty. 6. Jetty action during a 4-foot rise in the river. 7. The jetty after the flood, showing a large sand bar and shallow water instead of the original deep channel below the jetty

had been wrapped on a wooden cone to give it the desired taper. Tie wires were bent outward ¼ inch from the spiral to hold the form away from the steel during the pouring of the concrete. The next step in construction was to wrap Ruberoid roofing around the tied steel and the arms were ready for pouring.

On a jetty job of this size, only a small quantity of concrete could be used at one time, and a two cubic

foot 4-S Hawkeye mixer with a 1½-horsepower gas engine proved quite satisfactory and economical. The cross section of a jetty arm was small and contained a large percentage of steel, so no coarse aggregate was used in the mix. For the same reason, the water-cement ratio could not be the minimum, but generally ranged between 1.0 and 1.1. The mix was approximately 1 :1½. The concrete was run 4 feet up on the steel, leaving 2 feet to project into the center block.

In 24 hours the arms were ready to be assembled into units. On the corners of a 5-foot square, 4 arms were placed to form a pyramid. Then, to the upper end of each arm was spliced another arm. After this, a paraffin-coated canvas form was placed around the center and concrete of the above proportions was poured to make the complete unit. By this time the anchors were ready to be poured. A simple form for the anchor was made by excavating in the bank a saucer-shaped hole 18 inches deep and 5 feet in diameter. Steel rods were inserted normal to the face of the anchor, to keep it on edge when set in the river. Reinforcing for the anchor consisted of heavy wire mesh 2 inches in from each face.

SETTING UP THE JETTY

The 300-foot jetty was started on the top of the bank and extended down the slope into the river channel, making a 60 degree angle with the bank. The water was 4 to 5 feet deep and as the units weighed 2,000 pounds apiece and were to be connected continuously by four cables and two 60-inch widths of wire mesh, it was impracticable to set and connect them using an ordinary small barge. This difficulty was overcome by the use of a special pontoon-barge. Two long, narrow barges were connected overhead by an A-frame supported on 6- x 6-inch uprights. A 25-foot I-beam carrying overhead trolleys and chain hoists was hung parallel to the barges. By this means the units were cabled and wired and let down exactly in place. A small tender-barge brought the units out as needed.

ANCHORING THE BANK END OF THE JETTY

The bank end of the jetty was anchored to a concrete deadman. The anchors were placed up stream from the jetty at 50-foot centers. Each anchor was attached to 5 units by means of ⅝-inch cables. The jetty units were spaced 12½ feet center to center.

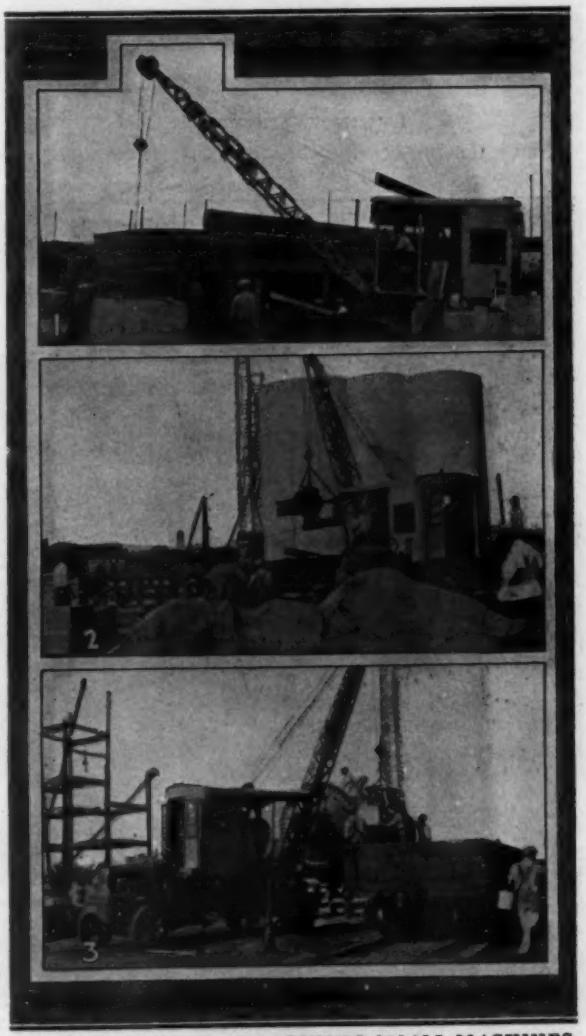
INSTALLATION SHOWS ITS EFFECTIVENESS

The installation had been completed only a short time when a flood occurred. In the spring and summer of 1928 the jetty was subjected to numerous rises. Perfect alignment was maintained throughout the high water period. The wire mesh caught the small drift and the larger pieces were held by the cables. The decreased velocity below the jetty caused a large bar to form next to the bank where originally the current was swift and the bank was caving. The recent photograph shows very clearly the protecting bar, which is effective for ¼ mile below the jetty. The banks, which were almost vertical, have sloughed off to a gentle slope and give no indication of further caving. The river channel is being diverted by the erosion of the sand bar on the far side of the river opposite the outer end of the jetty.

Tuttle Co. Uses Truck Mounted Crane to Handle Small Machinery

THE alert contractor who is constantly awake to the possibilities of labor saving equipment will find frequent opportunities to cut costs on his work. A case in point occurred at the new plant of the United States Gypsum Co., now under construction at Boston under the management of the Morton C. Tuttle Co., Engineers and Builders.

The contract included the handling and erection of machinery, all of which was delivered on cars. One of the foremen conceived the idea of using a mounted crane to unload the smaller units, and an available Browning crane mounted on a Mack chassis was hired. The accompanying pictures show this crane in operation. Although the site was rough and fairly crowded with construction materials and equipment, the crane managed to worm its way around and lift many pieces of equipment on to foundations already built, at an appreciable saving over any other method that could have been used.

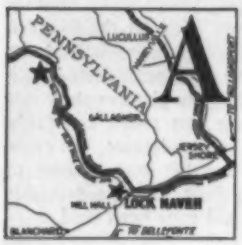


THE BROWNING CRANE MOVING SMALL MACHINES INTO PLACE

1. Placing a machine base on its foundation. 2. Lifting a small machine unit from the freight car to its foundation. 3. Unloading small machine units from freight cars

An 18.57-Mile Grading Job at Lock Haven, Pa.

The Past Construction Season Has Witnessed The Completion of Pennsylvania's Longest Grading Project



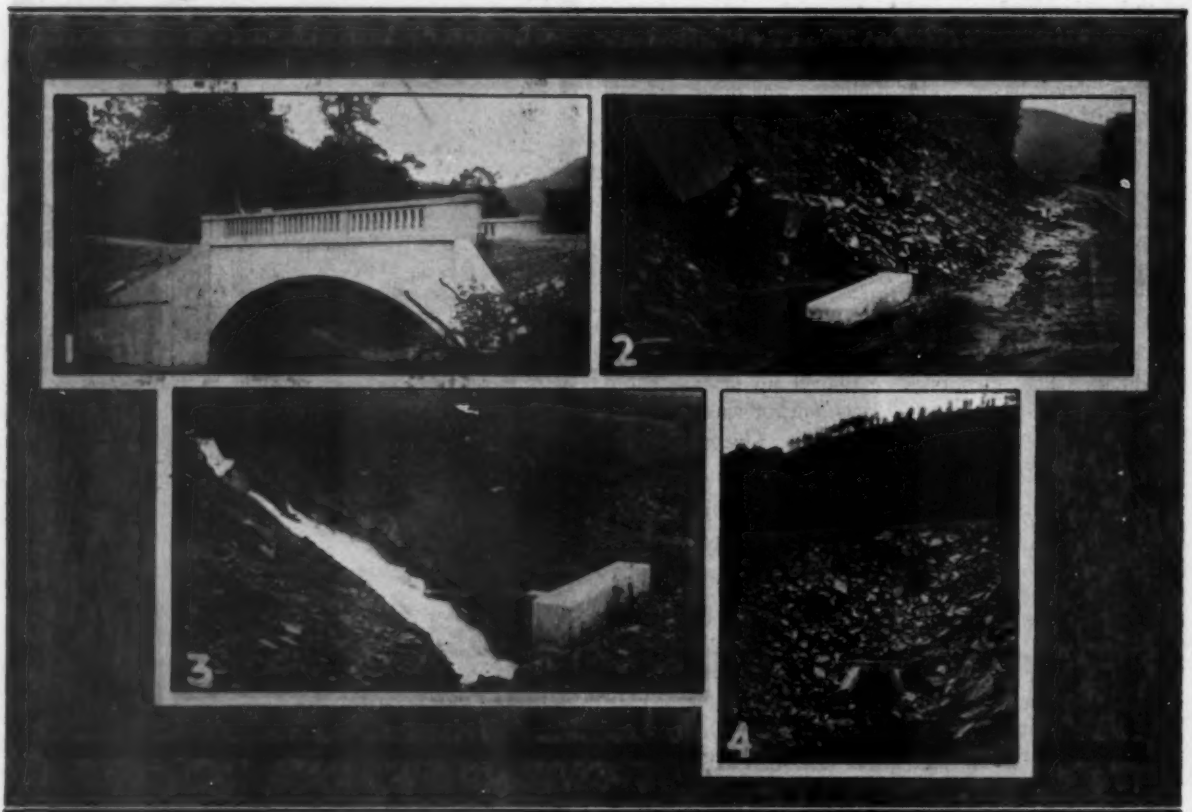
GRADING project of considerable interest was pushed to completion during the 1928 construction season by the W. C. Horn Co., Lock Haven, Pa. The project extended from the corporation line of Lock Haven, 18.57 miles in a northwesterly direction along the south bank of the Susquehanna River, to Hyner Station. The contract was awarded in 1926 and operations started on October 9 of that year.

Drainage Structures

Since the project for the most part runs along the edge of hills bordering the Susquehanna River, a large number of culverts, drains and two reinforced concrete bridges were necessary as follows:

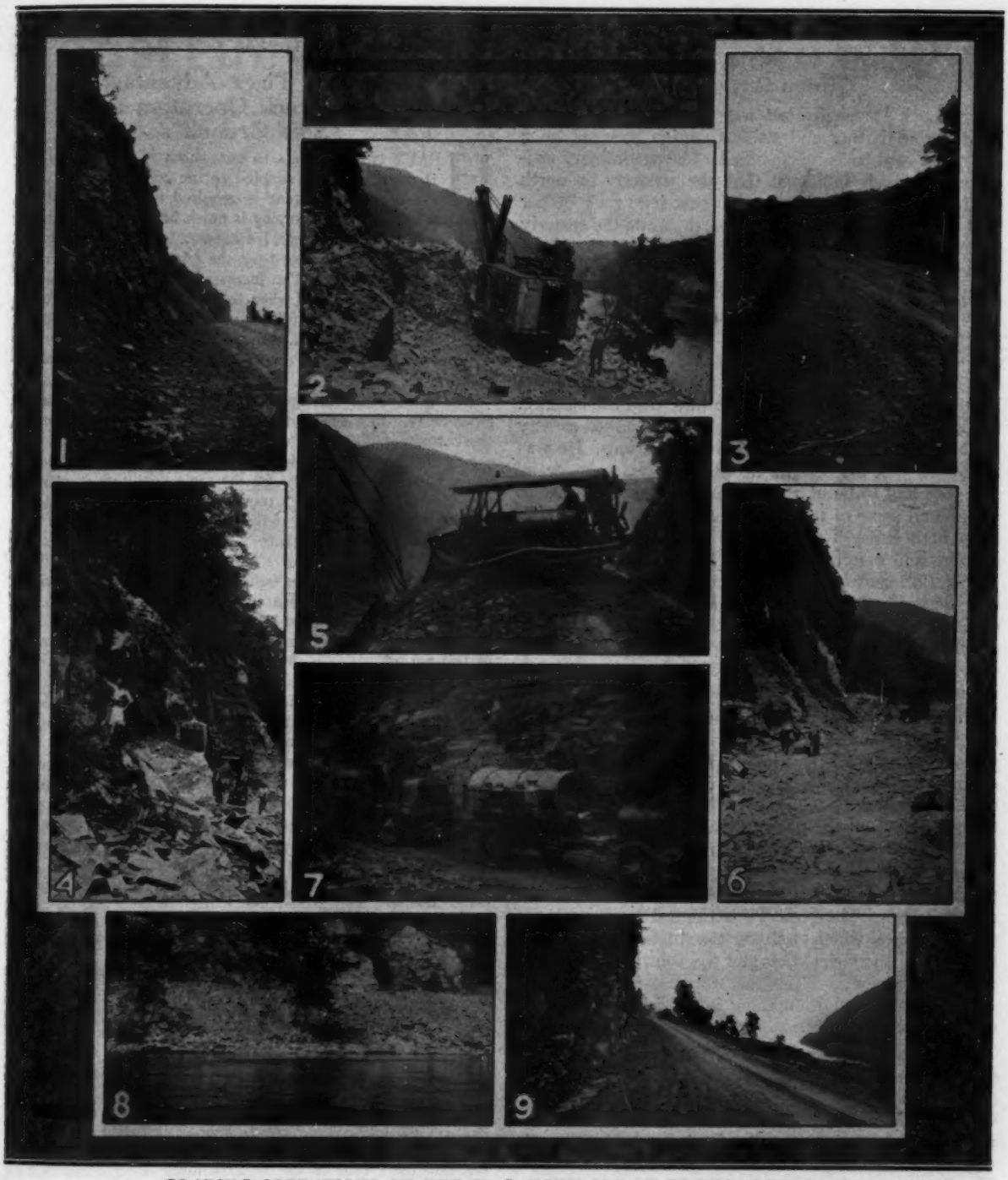
182	15-inch	reinforced	concrete	pipes	with	concrete headwalls
20	18-inch	reinforced	concrete	pipes	with	concrete headwalls
12	24-inch	reinforced	concrete	pipes	with	concrete headwalls
2	30-inch	reinforced	concrete	pipes	with	concrete headwalls
7	36-inch	reinforced	concrete	pipes	with	concrete headwalls
1	6 x 3	concrete box culvert				
1	6 x 4	concrete box culvert				
1	4 x 4	concrete arch culvert				
2	6 x 3.5	concrete arch culvert				
1	8 x 4.5	concrete arch culvert				
1	10 x 6	concrete arch culvert				
1	10 x 6.5	concrete arch culvert				
1	10 x 7	concrete arch culvert				
2	10 x 7.5	concrete arch culverts				
2	12 x 7.5	concrete arch culverts				
1	12 x 1.2	concrete arch culvert				
1	24 x 16.75	concrete arch culvert				
1	40 x 17.7	concrete arch bridge				
1	45 x 7	concrete arch bridge				

A 1:2:4 class A concrete was used in the arch rings of



DRAINAGE STRUCTURES ON THE LOCK HAVEN PROJECT

1. A 40-foot span 17.7-foot clear concrete arch culvert with parapets built over the Tangascootack Creek. 2. A pipe culvert completely closed by the cloudburst of June 5 before the side ditch had been completed. The culverts were later protected against wash by laying up dry walls of the shattered shale in a semi-circle. 3. A culvert in one of the meadow sections. 4. A culvert under a high fill



GRADING OPERATIONS ON THE W. C. HORN JOB AT LOCK HAVEN, PA.

1. *Finished construction on the Ferney Cut.* 2. *Bucyrus-Erie steam shovel starting second lift in the Wetham Cut.* 3. *Vista showing one of the heavy grades near the Lock Haven end of the job.* 4. *Steam shovel operating in Wetham Cut.* 5. *Caterpillar Sixty pushing fill over edge of grade with bulldozer.* 6. *Dificult construction in Wetham Cut.* 7. *The mobile gas tank refueling one of the dump truck fleet.* 8. *Progress of the work in Wetham Cut as seen from the Susquehanna River.* 9. *Finished grading in Ice Rock Cut. Photos* 1, 2, 4, 6, 8 *and* 9 *by W. A. Williamson*

the bridges and for bridge floors and parapets. A 1:2½:5 class B concrete was used in abutments, footings and stream bed paving as well as in headwalls. All of the reinforced concrete structures used for reinforcement Truscon steel rods ranging from ½- to ¾-inch round and from 1- to 1¼-inch square.

In the construction of the bridges the contractor used three one-bag Ransome power mixers, one 4-bag Foote power mixer, one ¾-yard Erie steam crane with clamshell bucket and three 1½-horsepower Domestic pumps.

The maximum elevation of the highway above the river is approximately 170 feet and the minimum eleva-

tion above the river is about 29 feet with a maximum grade of 8 per cent.

GRADING OPERATIONS

The Lock Haven Project was worked up in two sections before letting and the excavation was bid on a per cubic yard basis, unclassified. The preliminary estimates, however, indicated that the westerly or north section of the job would be 25 per cent solid rock, 50 per cent loose rock and 25 per cent earth, while the easterly or south section would be 10 per cent solid rock, 15 per cent loose rock and 75 per cent earth. The excavation price, as bid by the W. C. Horn Co., for unclassified material was 70 cents per cubic yard. The contract price was $643,993.95 for work in the township, $3,123.80 for the work in Lock Haven City, making a total of $647,-117.75. Lock Haven City paid the entire cost for the portion within city limits and the state paid the balance.

The entire project is a relocation which added greatly to the difficulty of the contractors' operations. He was unable to spot his equipment where it was most desirable, but had to build a temporary roadway in order to get around some of the heavy cuts and be able to work from both ends. This feature made it difficult to get supplies and materials on the job. Wet weather in the fall of 1927 and in June and August of 1928 considerably delayed the work. On June 5, 1928, a cloudburst occurred on this job which filled in practically all of the smaller drainage structures where work along the shoulders had not been completed. This necessitated additional cleaning up operations which were costly.

Since most of the job was through heavy side hill cut and included much solid rock, dynamiting was resorted to continuously which slowed up the work. The shale on this section shatters readily, making it easy to load with a battery of power shovels and inasmuch as cut and fill was very well balanced, the haul in no case was excessive. Fill on sections high over the Susquehanna River was handled by dumping near the edge of the fill and then pushing it over with a Caterpillar tractor and bulldozer. The New York Central Railway has a proposed line which follows the highway its entire length at a lower elevation and the contractor was consequently forced to keep the waste excavation below the railroad subgrade, making it difficult to get rid of excess material at some points.

The equipment used on the grading operation included one ¾-yard Erie steam shovel, five 1¼-yard Erie gas and air shovels, two Caterpillar Sixty tractors, two Caterpillar Thirty tractors, two bulldozers for use with the tractors, one Fordson tractor, twelve 2½-ton Brockway trucks, four 1½-ton Brockway trucks, one 6-yard Linn tractor truck, eight 1-ton Ford trucks, two 6-yard dump wagons, six 1½-yard dump wagons, two snatch teams, two 10-ton Buffalo-Springfield power rollers, four Ingersoll-Rand portable air compressors, one driller, eight air hammers, two Russell Super-Special graders, one Russell Special grader and one Russell light grader.

There were three gangs of about 15 men each working on drainage and five gangs of 11 men each on grading.

PERSONNEL

The project is being built by the Department of Highways of Pennsylvania under the direction of S. W. Jackson, Division Engineer, with Fred Moore as Senior Inspector. Homer Shaar was Superintendent for W. C. Horn Co. of Lock Haven, Pa.

Dual Pneumatic Tires Advantageous for Heavy Truck Operation on Soft Ground

HEAVY trucks are apt to mire down in soft ground and they are not well adapted to the conditions prevailing where layer dumping is required unless the material compacts easily. End dumping is much better suited to truck hauling. Even then for fast truck operation the load must be dumped some little distance from the edge and then be pushed over with a bulldozer. The increased confidence with which the trucks can be handled when they are not required to drive close to the end of the fill, to say nothing of the accidents which occur on such work, generally reduce the average time per load enough to more than pay the extra cost of the bulldozer.

Soft ground on the dump and around the shovel causes much delay. In a deep cut the moisture content of the soil at the bottom of the cut is apt to be high. Clay is often in a plastic condition, a good deal like stiff putty and yields readily under heavy loads. In the fill the same condition is retained and is made worse by every rain. Trucks may be mired down, causing a loss of time not only for the mired truck, but also for those sent to its assistance. Much of this difficulty is due to the use of trucks where a careful examination would have indicated that other hauling equipment should be used. On the other hand, while the presence of a large amount of such material should suggest the use of equipment other than trucks, there are relatively few large projects which have no material of this nature. If it is decided to use trucks in such a case, dual pneumatic tire equipment is a decided advantage, according to the Division of Management, U. S. Bureau of Public Roads. The trucks can then travel repeatedly over ground which could not be traversed with solid tires.

The cost of using the dual pneumatic tires is doubtless more than that for solid tires where the same rate of production can be maintained with either type, but it should be remembered that a very small difference in output will cover the difference in operating cost. With excavation at 50 cents a cubic yard and the trucks hauling 2 cubic yards per load, a difference of a few loads per day in favor of the dual pneumatic tires will justify their use.

Is This What You Expect?

PEOPLE are often astonished at facts about accidents published by insurance companies or safety commissions. When they are told that figures prove that the subway is one of the safest places in the world and that many serious accidents occur at home, they open their eyes in surprise, says the *New York Times*. The latest batch of statistics on accidents is more to be expected.

Of all kinds of accidents those costing the most occur in construction work. The New York State Department of Labor gives out this information. In building work more lives are lost and more time is lost than in other occupations. Cases of partial injury like an amputated finger or a stiffened leg must be cared for oftener than in any other industry. Minor injuries are more numerous and there are many more serious accidents.

The nature of the work is the cause of the greater number of such accidents. Falls result in heavy loss of time, health and life. In manufacturing, for example, falls cause many accidents, but a tumble from a table, stairs or ladder within a workroom does not compare with a fall from a high elevation. Moreover all other industries have already taken steps to guard against carelessness among workmen. Special attention to construction work accidents must be given before prevention in this line reaches the efficiency of similar work in other occupations.

Construction of the Municipal Reservoir at Janesville, Wis.

By Arthur C. Zellner

CONSTRUCTION of a water works reservoir involves problems not often encountered by many contractors and engineers, yet the manner in which this task is being performed in Janesville, Wis., has caused designers and superintendents of the job to declare it "is going so smoothly that we hardly know the work is in progress." The job is now nearly completed.

Only three major difficulties have thus far been encountered in the work—two of these were faults that might have been avoided by necessary precaution, while the third occurred because of soil conditions.

QUANTITIES AND PRICES

Capacity of reservoir	9,000,000	gallons
Excavation	32,000	cubic yards
Total concrete	6,223	cubic yards
Reinforcement steel	608	tons
Bituminous waterproofing	49,100	square feet
Six-inch drain tile	1,980	lineal feet
Excavation contract	$9,600	
General contract	$22,000	

Design

The Madison reservoir on which the design of the Janesville reservoir is based has a capacity of 6,000,000 gallons and has an inside diameter of 205 feet and that in Janesville has an inside diameter of 250 feet and 3,000,000 gallons greater capacity. Janesville engineers omitted a center partition wall which designers of the Madison job deemed necessary for giving service from one half while the other half was emptied for repairs or inspection. In Janesville, the entire reservoir may be emptied, during which time the city water service is then pumped directly from an 8,000,000 gallon horizontal cross-compound Murray pump.

The reservoir constructed for the city of Janesville is of the circular reinforced concrete type, entirely enclosed. The walls are 26 feet high from the floor to the bottom of the roof and are supported by counterforts. It has a hydraulic height of 25 feet to overflow. The counterforts are included in 16 construction units, each unit consisting of two 12-inch and two 8-inch counterforts and the intervening outside wall space.

Joints of construction units are sealed by 18-gage copper construction joints, and the walls are sealed at the floor by keying the concrete and by the insertion of 18-gage galvanized iron and copper strips in the footings prior to the erection of the walls.

Footings carrying outside walls and counterforts are 18 and 24 inches thick with two-way reinforcement for both tension and compression. Upper and lower reinforcement are of round and square one-inch steel at variable spacing of 6- to 18-inch center. Walls are 24 inches thick at the base and 16 inches at the top, the inside being perpendicular. They are 26 feet in height.

Supporting the four-way flat-slab drop-panel system roof are one hundred eighty-eight 24-inch round concrete columns placed 16 feet from center to center both ways. Each of these is reinforced by spiral reinforcement consisting of 18-inch by ⅜-inch spiral with 2¼-inch pitch, and six ⅞-inch vertical steel rods. Metal forms were used in construction.

WALL AND COUNTERFORT CONSTRUCTION FOR THE JANESVILLE RESERVOIR

Left, footings complete and erection of steel reinforcing started. P & H crane is shown ready to raise forms into place. Concrete tower is seen at the extreme right, and reinforcing bars are stocked at lower left and left center. Right, three phases of construction. Foreground, steel reinforcement for walls, background, forms ready for pouring and finished walls and counterforts at right

Pouring the Final Stretch of Wall Footing. Frank Haidlinger, Construction Superintendent, is at the Extreme Right with City Manager Henry Traxler Next to Him

Water will be pumped to the reservoir by the Murray pump, previously mentioned, at the city water works three miles from the reservoir site, and operated at a level 191 feet below the reservoir floor. The water will be forced into the reservoir through 24-inch cast iron piping and the flow to and from the tank will be controlled by check valves in a valve chamber attached to the reservoir proper.

The inlet pipe is laid under the reservoir floor and brought up on the side opposite from the valve chamber, while the outlet pipe is on the side of the reservoir near the valve chamber. Location of the inlet and outlet pipes at opposite sides of the reservoir was decided upon to provide good circulation of water and to prevent stagnation.

EXCAVATION

Excavation was started in October, 1927, and was completed in May, 1928. The extended time for this work was caused by cold weather and soil conditions which necessitated considerable blasting in the upper strata. The upper layer on the site is of clay, gravel and boulders. The lower strata, near the floor, is sand and gravel, except on one side where a dip in the clay strata was uncovered below the bottom of a footing. Freezing and boulders caused the most serious check in operations.

It was in the dip of clay near the floor that the first difficulty was encountered. With the exception of a stretch about 50 feet along the outside wall, the entire bed for the reservoir floor is of gravel. The contractor was obliged to excavate this stretch to a depth of more than 6 feet and fill it in with concrete before other construction could proceed. The excavation contract was awarded to the Bland Engineering Co., of St. Paul, Minn., and was sublet to Henry Puttkamery of Beloit, Wis.

CONCRETING FOOTINGS

The general contract was awarded to Jorgenson & Sons, Oshkosh, Wis., who sublet the job to Rasmussen Brothers, Oshkosh. Construction on the reservoir was started early in May and pouring of concrete footings began May 28, 1928. The footings were completed July 11, a total of 1,145 cubic yards of concrete having been poured.

For the footing of the 250 feet by 20 feet wide circle, a concrete mixture of 1 part cement, 2 parts sand and 3¼ parts gravel by volume was used, the resulting concrete containing 6¼ bags of cement in place. Marquette and Universal cement were used on the ob.

Material for the footing was hauled from the Janesville Sand & Gravel Co., pit, about 4 miles distant, in 3-batch trucks and was dumped into the skip of a 27-E Oshkosh paver. The resulting concrete was poured over reinforcement bars into the footing forms. Water for the entire concrete job was supplied from the city water works through the 24-inch main previously laid to the site, and was pumped from the end of this main by a triplex vertical pump. Practically no difficulty was encountered in construction of the footing, this being work of ordinary construction.

FORMS FOR WALLS AND COUNTERFORTS

It was in framing of the outside walls and counterforts that the contractor encountered some difficulty. The outside wall forms were built in two sections of 3-inch Oregon matched fir, bolted to 6-inch steel channels, five channels being used in each section. Each section was curved to the circumference of the reservoir, and each was 25 feet wide and 26 feet high, the matched fir being placed upright.

Inside wall forms were of similar material and mechanical construction the same, but on account of intervening counterforts they were made in three sections for each construction unit, each form being 15 feet wide by 26 feet high. Counterfort forms were of 2-inch stock bolted to 4 by 4 whalers. The forms were bolted together using truncated cones and eccentric bolts to allow for the removal of the cones and filling in with concrete after the wall concrete had set.

FAILURE OF OUTSIDE FORM

For several construction units, concrete was poured without trouble with the forms. The walls were about half up when one of the outside wall forms on a half unit gave way after about 100 yards of concrete had been poured. Frank Haidlinger, construction superin-

Staging for the Roof of the Janesville Reservoir, Showing the Spiral Reinforcement Columns Projecting Through the Staging

tendent, declared he could find no reason for the break but expressed a belief that it was caused by a defective whaler bolt. The bolt that snapped was near the middle of the form, and after that gave way, other bolts on the bottom of the form broke.

When the break occurred, bulk heads were installed in the form and jacks were used to hold the bottom in place. The form was forced back by jacks as tightly as possible and pouring in the unit was completed without further difficulty. Since the outside of the reservoir will be covered with earth upon completion of the reservoir, the bulge will not effect the appearance. The anchorage of the wall forms depended only upon their weight, instead of bolting to the footing. This may have caused the form to give way. Succeeding units, however, were built without mishap.

A-frames with notches were used to provide proper spacing for each reinforcing bar in the wall and counterforts. These frames were bolted to the footing.

ALL CONCRETE HANDLED BY CARTS

Specifications for the project did not allow spouting of concrete from towers, the engineers maintaining that spouting might result in segregation of the coarse aggregate. Concrete for the walls was raised from the mixer on the floor of the reservoir by a steam hoist and was dumped into a steel hopper at the top of the tower.

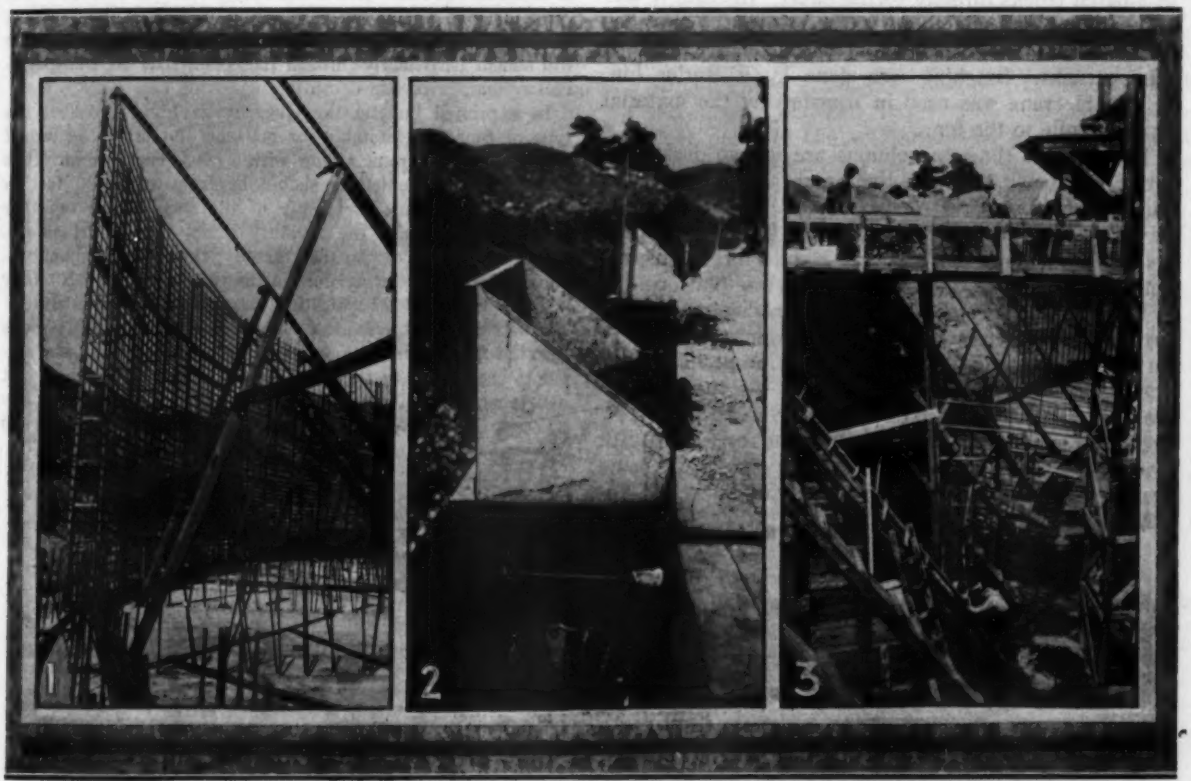
From this hopper, the concrete was released into dump carts and wheeled to chutes on top of the wall forms. These chutes were simple galvanized iron boxes with 4-inch openings. They were so made as to be easily moved along the top of the forms to permit even distribution of the material.

While the concrete was being poured into the forms, three men were kept inside continuously to puddle it around the reinforcing bars. They were equipped with steel helmets and boots, the helmets to protect them from concrete as it splattered against the reinforcement.

INITIAL MIX GAVE POROUS CONCRETE

A construction difficulty was encountered also in building the walls. While a proportion of 1 part cement to 2 parts sand and 3¼ parts gravel was used for the footings, it was found that the fine aggregate was so coarse that the resulting concrete poured into the first construction unit of wall and counterforts was rough and too porous to be watertight. The proportion was changed slightly to make the concrete more plastic and more dense.

Whether to gunite the wall in that section or to set the inside wall form about 3 inches from the wall and fill the space with concrete was debated. It was believed the latter method would be most economical for the small amount of work to be done, but how to join the narrow slab of concrete to the wall was a question raised by city engineers. The gunite method was finally chosen and the work was done by the Gunite Concrete and Construction Co., Kansas City, Mo. A layer of wire mesh was first nailed to the wall proper, and this was covered with coarse concrete and one finish coat. Appearance of



REINFORCING AND CONCRETE HANDLING FOR WALLS AND COUNTERFORTS

1. *A-frames and reinforcing steel in place. Dowels in footings were tied in to the concrete of the counterforts and walls.* 2. *Galvanized iron chutes with 4-inch openings used at top of reservoir wall forms to permit easy dumping and distribution of material.* 3. *Concrete hoisting tower, receiving platform and hopper. Ends of counterfort forms are seen at the lower left*

the completed repair was similar to other sections of the wall where no repair had been made. Engineers pronounced the repair perfect.

FAIR SPEED MAINTAINED

The contractor maintained an average of two construction units per week in pouring the concrete, this amounting to 50 feet of outside wall and two 12-inch and two 8-inch counterforts. After about half of the wall and counterfort work was complete, work was started on the sub-floor and columns, this work taking place on the days when the concrete in the walls was setting.

Upon completion of the footing for the outside wall, it was found impracticable to haul the sand and gravel in 3-batch trucks directly to the paver. Instead, it was placed in a stock pile about 100 feet from the entrance to the reservoir and batched to the mixer in two Ford dump trucks. Batching was done by a Butler bin. A P & H crane was used in transferring the material from the pile to the bin.

Footings for the roof columns are in two decks, the lower deck being 10 inches thick and the upper 8 inches thick. Each footing carries six dowels. A Leach 1-yard paver was used for some of this work. The P & H crane was used to move the wall and counterfort forms, together with the hoisting tower and carting platform.

By the time the outside wall was finished, except for one space between two counterforts which was used as an entrance, staging had been erected in one quarter of the circle for work on the slab roof. As the concrete was being poured, a part of the construction crew erected staging in another quarter of the reservoir. With one half of the roof concrete setting and forms being removed, the remaining half of the sub-floor was finished.

WATERPROOFING

The entrance way is not to be closed until nearly the end of the job on both roof and floor. Before closing this, membraneous waterproofing of the sub-floor will be laid, this consisting of one layer of 15-pound tarred felt mopped onto the floor. The sheets are to be lapped 4 inches.

TESTING

Sixty days after pouring the last portion of the wall, the reservoir will be tested. The roof of the valve chamber and the reservoir will be washed down to test for leaks. Then the reservoir proper will be tested. This will be done by filling with 25 feet of water in stages of 10 feet per day. This completed, back-filling will be done and the job turned over to the city.

PERSONNEL

The reservoir was designed in the city engineer's office by C. V. Kerch, Joseph Lustig, Jr., and B. J. Sunny with the assistance of Henry Traxler, City Manager of Janesville.

Mark Your Towns for Air Pilots

IN the days when all traveling was done by rail, the name on the railway station as it flitted by served to acquaint one with his progress. Today motorists find their way by the innumerable direction signs along the highways, but we are on the verge of a speedier transportation through the air and some method of identifying towns and villages, particularly, is necessary for air pilots.

The construction industry has been asked to cooperate with the Daniel Guggenheim Fund for the Promotion of Aeronautics, New York, in its nation-wide campaign for roof marking, which will identify the country's towns to the aviator. Such identification is a first requisite for an air transportation system which will heighten the efficiency of American business by swifter means of communication.

As a basis for the work, the Guggenheim Fund supported by the Postmaster General, has asked some 8,000 postmasters in towns with a population between 1,000 to 50,000 to take the initiative in seeing that their communities are identified by roof markings. The postmaster is urged to enlist the support of civic organizations, such as the American Legion, the service clubs or the Chamber of Commerce or individual corporations. Many corporations throughout the country have already been active in marking the roofs of their own buildings for purposes of aerial navigation. This is not only a civic act helpful to the community in which the corporation is located, it is also a direct benefit to business as a whole, since it is the latter which will benefit particularly through the commercial air transportation system.

In a printed bulletin the Guggenheim Fund describes the type of roof most suitable for marking and urges the use of block letters in chrome yellow with a black background. It is suggested that the letters should be from 10 to 20 feet in height and on roofs preferably of tile shingles, tin or other metal or slate where the visibility is not reduced by smoke. Besides the name of the town or city, the marking should include an arrow pointing due north with the letter "N" over it and a smaller letter indicating the airport if there is one.

What manufacturers and distributors have already done their bit in this direction? We know that some are using airplanes themselves to facilitate their business, but we have not had reports yet of any who have used their buildings as airway sign posts. We shall be glad to receive photographs and descriptions for publication.

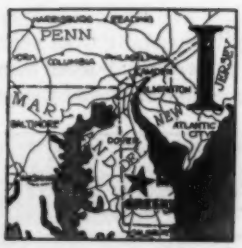
Youth Will Be Served

BIG HEARTED DAN MOVES THE CLUB HOUSE OF THE PICKLE WOIKS GANG WHEN IT WAS IN THE PATH OF A NEW BASEMENT EXCAVATION!
PICKLE WOIKS CLUB HOUSE
WE SURE WUZ IN A PICKLE TILL THE BIG BOSS SAID WE COULD MOVE THE CLUB HOUSE OVER TO THE NEXT LOT
DAN MOVES 'EM AND HOW!
PRIVATE ROAD KEEP OFF!
HOORAY! DE GANG DON'T HAVE TO REBUILD THEIR CLUB HOUSE NOW!

Courtesy of Northwest Eng. Works

Sand Asphalt Highway Construction in Delaware

Local Material Used on Well-Organized Job With Unique Spreader Developed by the Contractors



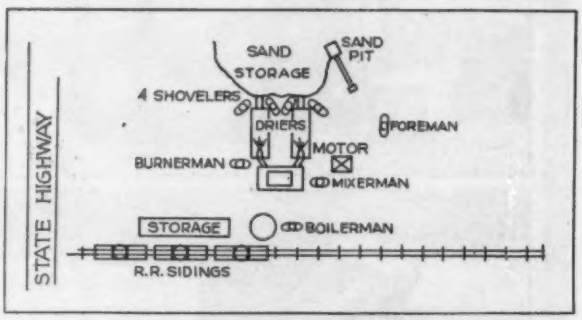
IN MANY sections of Delaware, especially along the coast, sand abounds and other road building material is lacking. In such places it has been frequently found possible to use this local material and bind it into a stable pavement by the use of asphaltic cement. In considering work of this nature it is first necessary to make a study of the available sand. The grading or proportion of various size particles should be determined by passing it through sieves and if it is fairly uniform from coarse to fine and thus matches closely the grading of a so-called asphalt sand, it can be used for the construction of a satisfactory pavement. The usual limits of grading for a sheet asphalt sand are: 100 per cent shall pass a 10-mesh sieve, 14 to 50 per cent shall pass a 10-mesh sieve and be retained on a 40-mesh sieve, 30 to 60 per cent shall pass a 40-mesh sieve and be retained on a 80-mesh sieve, 16 to 40 per cent shall pass a 80-mesh sieve and be retained on a 200-mesh sieve, and not over 5 per cent shall pass the 200-mesh sieve. At times a beach or bank sand will run too coarse or too fine and will not be satisfactory unless it is possible to mix two sands in a proportion so that the combined product has a satisfactory grading, which will compact to a stable paving mixture.

During the summer of 1928 there was under construction an 8.02-mile stretch of paving of the sand asphalt type known as Federal Aid Project No. 46, in Sussex County, Delaware, extending northeast from Greenwood toward Milford. This is a deep sandy rural county in the south central part of the state, and therefore some type of surfacing utilizing this local material was highly desirable. While the main roads are paved, many of the secondary and connecting roads still require paving. The sand asphalt pavement presents an inexpensive and highly desirable type.

Rough Grading

An analysis of sands along this project indicated that a satisfactory material was available at a very convenient point at the southwest end of the project at the edge of Greenwood and at the intersection of the railroad and the main State Route 13. A typical grading analysis of this sand which follows closely the sheet asphalt grading limits is as follows:

Passing 10-mesh sieve	100 per cent
Passing 10-retained on 40-mesh sieve	33 per cent
Passing 40-retained on 80-mesh sieve	48 per cent
Passing 80-retained on 200-mesh sieve	17 per cent
Passing 200-mesh sieve	2 per cent

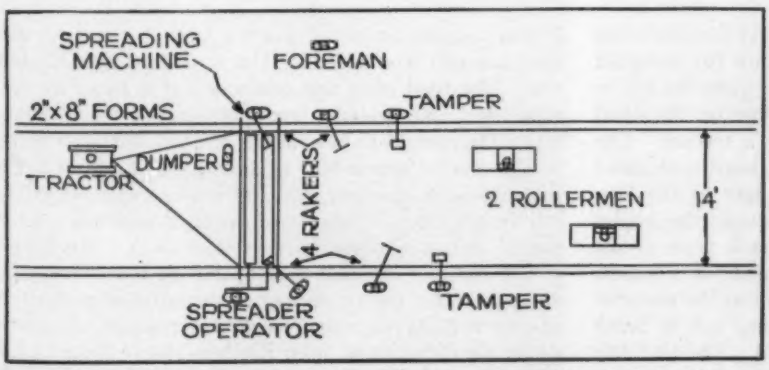


Layout of Hot Mix Plant

Central Paving Plant

At this point the asphalt paving plant was set up and a crane installed to excavate the sand and pile it at the feed end of the driers. The plant had a capacity of 3,000 square yards of 2-inch pavement per day. Two driers, heated by burning fuel oil in an internal combustion chamber, raised rapidly to the desired temperature an ample supply of sand. The mixer was of large capacity, handling 2,000-pound batches. The power for operating the driers, mixers, etc., was supplied by an electric motor. Petroleum asphalt was received at the railroad siding in tank cars and pumped to a storage tank.

The mixture used for the base was 1860 pounds of sand and 140 pounds of asphalt cement, thus giving a bitumen content of 7 per cent. The surfacing mixture averaged 1,530



Organization for Spreading, Raking, Tamping and Rolling the Hot Mix

pounds of sand, 270 pounds of limestone dust, and 200 pounds of asphalt cement, which gave a bitumen content of 10 per cent and 13½ per cent of filler. The asphalt had a consistency, as shown by the penetration test, of 40 to 50.

The hot sand asphalt mixture was hauled to the road in light trucks carrying a load of 2 batches or 2 ton.

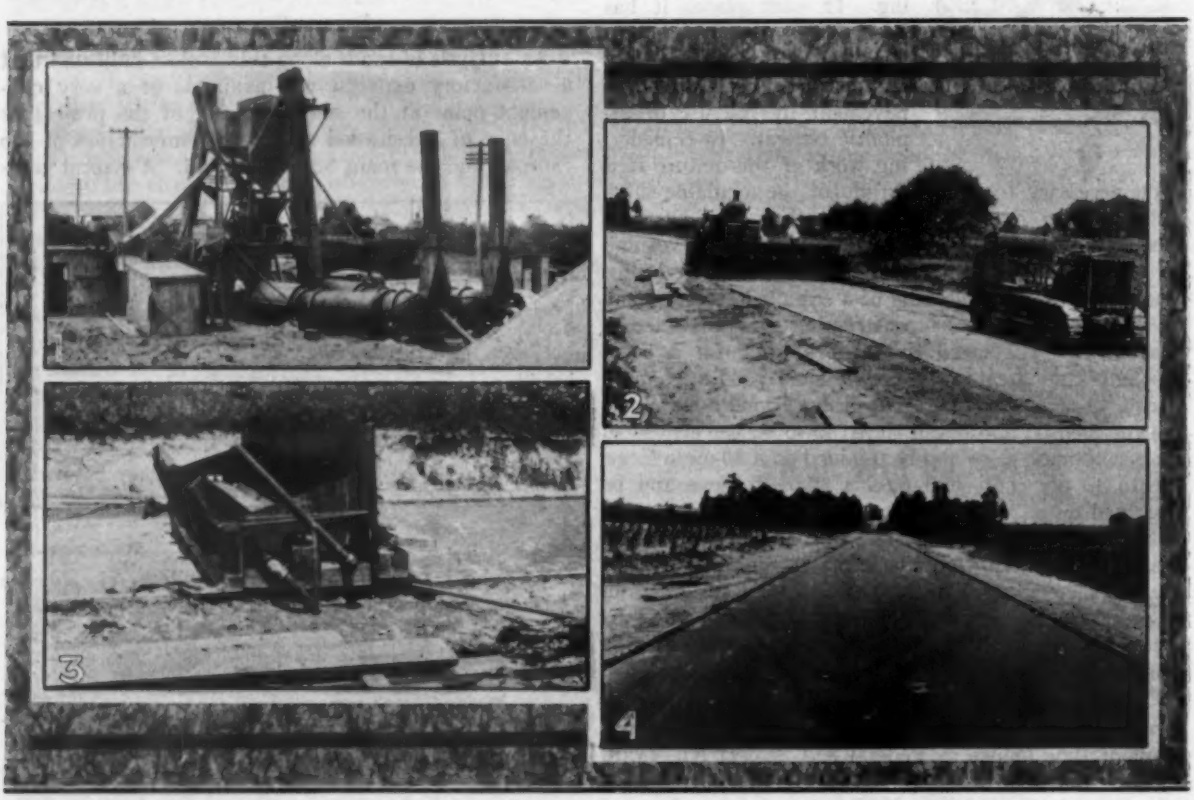
ASPHALT SPREADER BOX

The roadway was carefully shaped to the proper line and grade and forms consisting of 2- x 8-inch planking were securely staked in place. These were left in place for curbing to support the edges of the pavement. By the time they rot out the shoulders have become sufficiently compacted to serve this purpose. Of particular interest on this work is the method used for spreading the hot sand asphalt mix. The contractor has designed a very satisfactory spreader box which spans the entire width of the roadway of 14 feet. It rides on the wood form boards and is pulled forward by a tractor. The box is framed with heavy timbers and lined with sheet steel. Two angle irons extend the length of the box. When material is dumped from the trucks the angles have their flat faces horizontal and catch most of the load. They are mounted so that by means of a handle they can be tilted and thus gradually drop the material on to the subgrade and at the same time cut or break down any lumps that may have formed. The rear side of the box has a cutting edge shaped to the cross section of the roadway and strikes off the mix to the proper depth so that when rolled it has the desired thickness and shape. This cutting edge is adjustable so that it can be set for either base or top. The spreader box leaves the material with a smooth surface, and since it spans the entire width of roadway little hand touching up is necessary prior to rolling. The roller is able to work close up to the spreading operation and good compaction is obtained. The thickness of the sand asphalt base course is 4 inches after compaction and the wearing surface which contains the filler is 2 inches after compression.

ORGANIZATION

The plant gang consisted of a foreman, burner man, boiler man, mixer man, and four shovelers to feed sand. It was planned to install a screw feed to the sand elevators which would reduce the four shovellers to but one. The road gang was composed of a foreman, two roller men, one spreader box operator, one truck dumper, two tampers, two box rakers, and two surface rakers.

This outfit turned out an average of 1,000 to 1,100 feet of 4-inch base per day and it was expected as the job became better organized to turn out daily 1,800 feet of 14-foot roadway base 4 inches thick. The length of top laid per day was double that of base. The contract price for the six inches of mixed sand asphalt in place was $1.75 per square yard. The project, which was under the direction of John Kitchens, State District Engineer, involved 66,000 square yards of the sand asphalt pavement and 26,000 cubic yards of excavation, which



BUILDING THE SAND ASPHALT PAVEMENT NORTHEAST OF GREENWOOD, DELAWARE

1. Mixing plant near Greenwood on Route 13 near railroad crossing. 2. Tractor hauling spreader box. Roller is seen immediately behind the spreader. 3. Detail of spreader box designed by the contractor. 4. Completed 4-inch base in place at cost of $1.75 per square yard

together with structures was let at a total bid of $160,-251. The successful bidder on this project, the Highway Engineering and Construction Co., of Selbyville, Delaware, had previously built a considerable mileage of sand asphalt roadway in North Carolina and Delaware. J. G. Townsend III was the Superintendent in charge of this work.

OTHER SIMILAR DELAWARE PROJECTS

Other sand asphalt projects in Delaware include 5 miles laid in 1925 on the Concord-Hardscrabble Road, east of Seaford and 5 miles laid in 1925 east from Selbyville to Williamsville, as well as most of the streets in the town of Selbyville. These pavements were all inspected in 1928 and found in excellent condition.

MAINTENANCE COSTS

This work demonstrates that it is possible, at an expenditure of $20,000 per mile, to provide a smooth, easy riding boulevard in place of an almost impassable sand trail. Under average conditions the annual cost of this construction can be taken at $1,000 for interest and $1,000 for depreciation and maintenance or a total per mile of $2,000. Thus it might be said that (2,000 ÷ 365) $5.50 per day would be the cost to perpetuate a mile of this improvement. It should be remembered that the original improvement includes the grading and base for future resurfacing so that the above estimate is quite liberal. Surely there are many roads through sandy sections on which the traffic would justify an outlay of $5.50 per mile per day.

With a traffic of 275 vehicles per day, a toll of $0.20 would pay for a 10-mile stretch of improved roadway. The inevitable increase in traffic, with the improvement of the road and also the passage of years, should show that an improvement of this kind is justified on unimproved roads having a traffic considerably less than 275 vehicles per day.

Rust Resisting Airport Drain Pipe

SUBDRAINAGE pipe especially adapted for airport drainage is announced by the Armco Culvert Mfrs. Assn., Middletown, Ohio. This type of drain consists of corrugated iron pipe similar to that used for more than 22 years in highway, railway and municipal drainage but with perforations in the valley of each corrugation for a portion of its circumference. The qualities of this product which especially appeal to airport officials and to aviators are the facts that it is not readily crushed, it resists frost and it collects water rapidly.

Armco Drainage Pipe Suspended to Show Perforations

The high drainage capacity of Armco perforated pipe is said to be due to the small closely spaced holes distributed throughout its entire length. There are no open joints, nor can the pipe separate or disalign in service. By placing the pipe with the perforations downward, water is admitted freely while roots and soil are effectively excluded. The use of Armco ingot iron in the manufacture of the pipe assures rust resistance and durability.

Will History Repeat Itself?

ANCIENT history is always interesting and students tell us that history repeats itself. If that is true a forecast for future practice for construction work may be made by consulting some bids received by a railroad company for the construction of a new line in Pennsylvania in December, 1877. The contract was awarded at the following prices, according to the *Construction Advisor*, Jefferson City, Mo.: earth excavation, 12 cents; loose rock excavation, 25 cents; solid rock excavation, 48 cents; culvert masonry, $2.25 per cubic yard; bridge masonry, $4; arch culvert masonry, $5.40.

Another interesting feature of that work was that the low bid was rejected because the contractor was not considered responsible. His bid was 10 cents for earth excavation. Even in those days the irresponsible contractor was present. In that respect, at least, history has been repeating itself with monotonous regularity.

The Cost of Detours

THE average motor vehicle operating cost for each 1,000 feet over a hard-surfaced rural road is approximately $0.023. To illustrate what a big factor transportation costs are in connection with the reconstruction of pavements, let us assume that the reconstruction of one mile of rural highway pavement 18 feet wide will necessitate a detour 2,000 feet longer than the pavement under reconstruction. If the road is closed for a month and a half or 46 days and the traffic consists of 5,000 vehicles per day, the additional transportation costs will be $10,580. The number of square yards in the pavement will be 10,560. The additional transportation costs, therefore would amount to about $1 for each yard of pavement reconstructed. If the detour were a dirt road, the operating costs would be 25 per cent more or equivalent to about $1.25 for each yard of pavement. This does not take into consideration the cost of loss of time which is a big factor in commercial highway transportation cost. It is easily seen that under such circumstances, an additional cost of more than $1 a yard for construction of the pavement to obtain a long period of service without construction would be an ultimate economy.

Similar illustrations would show a greater economy through the construction of long life pavements in closely built-up communities. The additional operating costs due to detours would be far greater as there would be, in many instances, not only more vehicles, but a greater percentage of trucks and busses. Even by using the facts in the above illustration and simply increasing the number of vehicles to 10,000 a day an additional cost of over $2 a yard would be an ultimate economy.

The financial loss to abutting property and business interests in built-up communities during reconstruction is known to be very great. There is, however, no yard stick with which to measure it in dollars and cents, but it does not take an unusual imagination to visualize a substantial dollars and cents loss not only to each business establishment located on the street under construction, but to many others carrying on business arrangements with them. Under the conditions discussed, the ultimate economy of a long-life pavement as compared with a shorter life pavement is plainly evident.

One of Two Link-Belt 21-Foot Portable Belt Conveyors Used on a Philadelphia Sewer Contract

Portable Loader Used in Constructing a Sewer

THE utility of a portable loader in sewer construction is well illustrated by Mason & Hanger, contractors, New York, who have been working recently on a sewer contract in Philadelphia. The sewer is 12 feet 3 inches in diameter, 4,000 feet long and is from 30 to 40 feet below ground level. The construction work was carried in both directions from a central shaft and in each heading a 21-foot Link-Belt portable conveyor was used. Each conveyor was mounted by the contractor on a small 4-wheel industrial truck running on a 30-inch gage track. The discharge height of the conveyor is 4 feet 8 inches above track level.

Men shovel the dirt into the low foot end of the conveyor which is of the belt type and carries the dirt along its 21-foot inclined length up to the discharge point where it delivers into a side dump car. The side dump cars are pulled along by storage battery trucks to the elevator shaft where the excavated materials are raised to the surface for disposal. The conveyor is pushed along the track as the work progresses.

Formerly it was possible to handle about 5 feet of tunnel for this size of sewer per day, but with the aid of the portable loaders, and careful planning of other details, the work has been speeded up considerably, so that from 60 to 70 feet per week is the regular advance giving a little better than 10 feet per day.

This is a concrete example of what a contractor can do when he makes up his mind to analyze every detail of the work to be done and to beat out competition by using mechanical material handling equipment whenever it is likely to effect a reduction in his excavating and construction costs.

Lafayette Rolled Earth-Fill Dam Subsides

THE Lafayette Dam, one of the major projects of the Mokelumne River water supply project for the East Bay Municipal Utility District of California, on September 17 when the project was a little more than half completed, failed through the settlement of the central portion. The equipment and methods employed in the construction of this dam were described in an article in the July, 1928, issue of CONTRACTORS AND ENGINEERS MONTHLY.

The structure was to have been one of the largest rolled earth-fill dams in the world, if not the largest. It was to measure 900 feet thick at the base, 170 feet high, narrowing to a 20-foot roadway at the top and would contain approximately 2,000,000 cubic yards of material. On September 17 cracks began to appear in the downstream slope and a gradual settlement of the center, principally downstream, continued. An area approximately 500 feet square sank 20 feet at the center, as shown in the first illustration. The second illustration shows some of the cracks indicating how well the fill was compacted, showing that the cause of the failure could not be attributed to the methods of construction nor design. The report indicates that the failure was probably caused by foundation troubles, as the foundation apparently was not capable of supporting the superimposed load.

The contractor for this project was the George Pollock Co., who began work in July, 1927, operating two 8-hour shifts out of each 24 hours. The contract price was $1,370,685.

VIEWS OF THE FAILURE OF THE LAFAYETTE EARTH DAM IN CALIFORNIA

Above—A portion of the 500-square foot area which subsided about 20 feet. Below—Some of the cracks showing how well the fill had been completed

Horse Sense

HARRY BOGGS put this one at the head of the interesting column he writes in the *Construction Advisor*, published by the Associated General Contractors of Missouri. "The contractor who complains of not being able to get along with the engineer on his job might improve the situation a lot if he followed the tactics of the Scotch farmer whose horse broke out of the pasture and wandered away. The Scotchman thought where he would go if he were a horse, and he went to the place and the horse was there. A lot of unnecessary clashes between engineers and contractors could be avoided if they each understood the other's method of thinking."

PAVERS

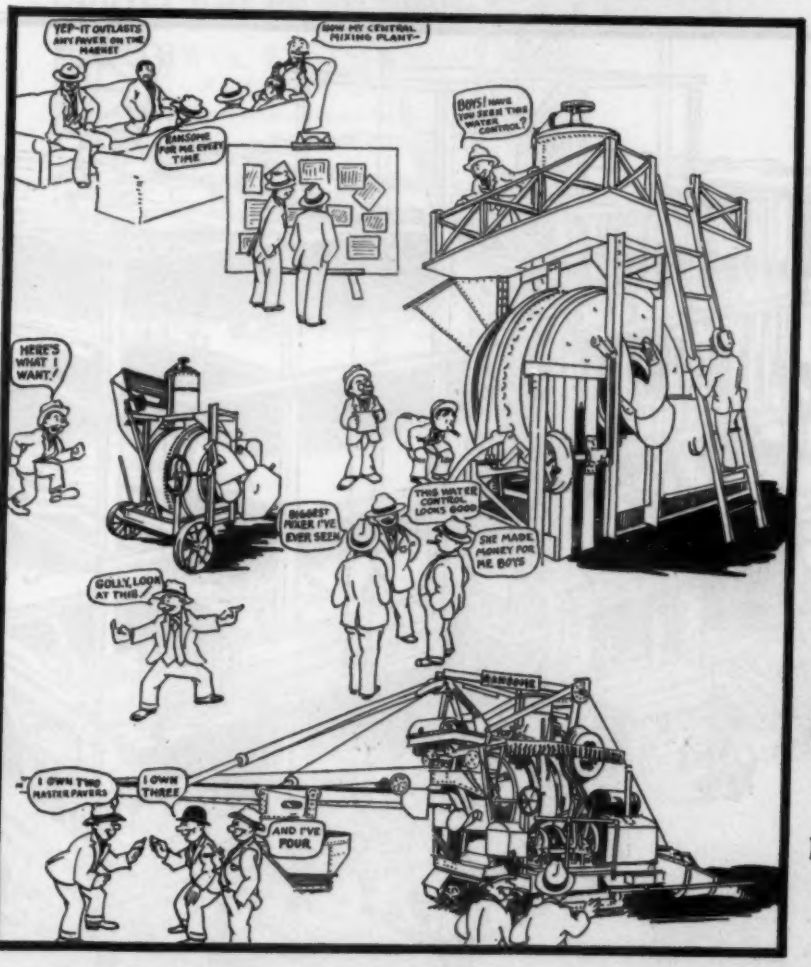
MIXERS

PNEUMATICS

The Ransome

Booth WW103 at the ROAD SHOW~

CHUTES~


YEP—IT OUTLASTS ANY PAVER ON THE MARKET
RANSOME FOR ME EVERY TIME
HOW MY CENTRAL MIXING PLANT—
BOYS! HAVE YOU SEEN THIS WATER CONTROL?
HERE'S WHAT I WANT!
BIGGEST FIXER I'VE EVER SEEN
THIS WATER CONTROL LOOKS GOOD
SHE MADE MONEY FOR ME BOYS
GOLLY, LOOK AT THIS
I OWN TWO MASTER PAVERS
I OWN THREE
AND I'VE FOUR
RANSOME

STEEL TOWERS

MIXERS

TILTING MIXERS

PAVERS

Ransome Concrete Machinery Company

1909—Service for 39 Years—1948

Dunellen New Jersey

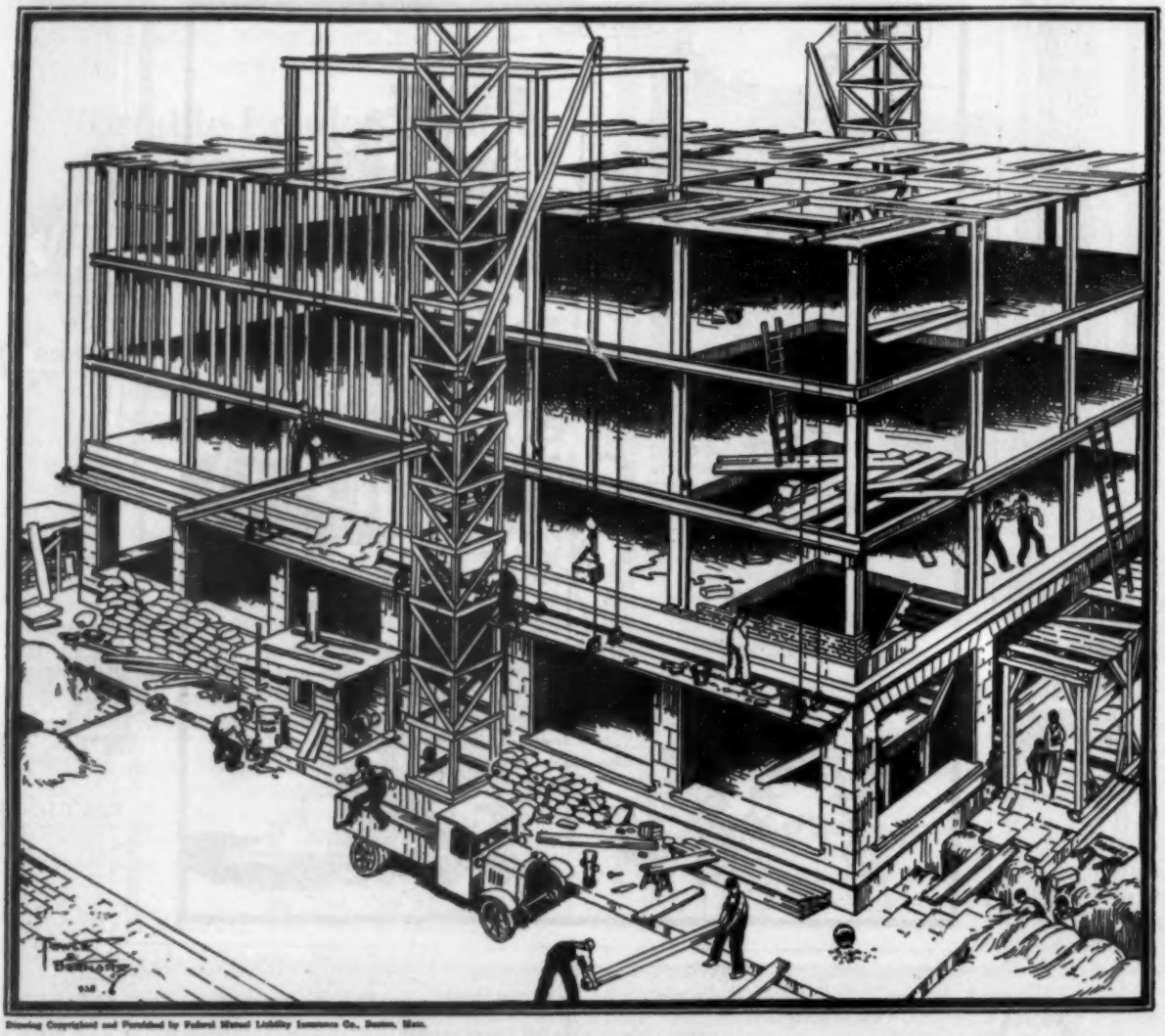
New York Safety Poster Contest Awards

THE first New York Safety Poster contest which was held under the auspices of the Committee on Accident Prevention of the Building Trades Employers' Association closed November 30 and the prize winners were announced December 10, 1928. Thousands of foremen and workmen representing the fifty-two crafts which operate in the Metropolitan district participated and the campaign brought many hundreds of letters to the committee from people ineligible to compete who were interested in the campaign.

The contest consisted of finding as many unsafe conditions as possible in the picture reproduced below which appeared on posters distributed among the building trades, and submitting this list of hazards along with a short essay telling how jobs recently worked on by the contestant might have been made safer.

Awards were made to fifteen successful contestants at the meeting of the committee, Hon. James A. Hamilton, Industrial Commissioner of the State of New York, making the presentations. The first prize was won by William A. Murray, a bricklayer employed by Thompson-Starrett Co., who listed 111 hazards which he found in the picture. Mr. Murray stated in accepting the award, which was a check for $100, that he had studied safety on buildings for thirty years and is convinced that there is a strange attitude of fatalistic irresponsibility on the part of the workmen. He advocates, besides maintaining proper safeguards, a system of education for the workmen.

"There is no luck or chance around a building," said Mr. Murray. "We must develop workmen to tackle this problem of safety. Things will not move by themselves, they must be moved and moved intelligently. I believe in a campaign of education with literature and talks to the men direct to bring vividly before them the seriousness of carelessness and the need for proper protection on their work."



Drawing Copyrighted and Furnished by Federal Mutual Liability Insurance Co., Boston, Mass.

Under the Heading "What's Unsafe with This Job?" the Committee on Accident Prevention of the Building Trades Employers Association, New York City, Sent Copies of This Picture to Any Building Workers in New York City with an Offer of a $100 Prize for the Best Answer to the Question and a 200-Word Statement as to How Jobs Where the Men Had Recently Worked Could Have Been Made Safer

At the Road Show

ROAD builders in attendance are cordially invited to pay us a call at Section AY-6 Central Armory Building. A complete Moore Speedcrane and Shovel will be on display. . . .

1929 CONVENTION & ROAD SHOW A.R.B.A. JAN. 14 - 18 CLEVELAND, O

MANITOWOC ENGINEERING WORKS
MANITOWOC, WISCONSIN
(Sole Licensees to manufacture and sell Moore Speedcranes and Shovels.)

Chicago Agents:
MOORE SPEEDCRANE CO.
2916 W. 26th St.

Eastern Sales Agents:
FORSYTHE BROS.
30 Church St., New York, N. Y.

SPEEDCRANE
MOORE + MANITOWOC
SHOVEL ~ CRANE ~ TRENCHOE ~ DRAGLINE

WINNERS AND OFFICIALS IN THE SAFETY POSTER CONTEST HELD UNDER THE AUSPICES OF THE BUILDING TRADES EMPLOYERS' ASSOCIATION, NEW YORK CITY

First row (left to right) Samuel B. Donnelly, Allied Building Metal Industries; D. H. Dixon, Vice President, Turner Construction Co.; Rudolph P. Miller, consulting engineer; Hon. James A. Hamilton, New York State Industrial Commissioner; J. E. Rutzler, President, E. Rutzler Co.; and William G. Wheeler, Executive Secretary, Accident Prevention Committee, Building Trades Employers' Assn.

Second row: Harold Baer, tinsmith; Carl G. Almquist, steel metal worker; Thomas R. Smith, steamfitter; William A. Murray, bricklayer and winner of the first prize; William Bradley, apprentice bricklayer and Harry Wenz, carpenter

Third row: A. Steinhilber, foreman plumber; Louis B. Fassler, ornamental iron and bronze finisher; Adam H. Birney, Jr., electrician, and Joseph Crowley, laborer

Mr. Murray's essay follows:

How Jobs Could Be Made Safer

Methods and conditions in building construction have changed so rapidly within recent years it may be safely asserted a revolution has taken place.

One of the contributary causes of the increase in accidents is the failure or inability of workmen engaged in building construction to adjust themselves to these changes.

The writer has been employed for many years on large building operations and is at present working on the largest operation in New York.

The general contractors, superintendents, and foremen have taken every precaution humanly possible to prevent accidents, yet there is a strange attitude of fatalistic irresponsibility on the part of the workmen.

A large proportion of accidents is due to negligence on the part of the injured or negligence on the part of fellow workers.

The operations on which the writer of this paper has been employed could have been made safer if there had been in existence a comprehensive system of education of the workmen, and the following program is respectfully offered for consideration:

1. A campaign to be inaugurated of direct personal appeal to workmen by distribution of books or pamphlets and, if possible, short talks, with the object of developing a sense of responsibility in the workmen.
2. An advisory service to be established, a representative of this service to visit building operations and advise those in charge in regard to safety.

It is the belief of the writer that some such program, conducted persistently, would tend to reduce the number of accidents to the proverbial "Acts of God."

(Signed) WILLIAM A. MURRAY,
3504 Rochambeau Avenue, New York City.
Occupation—bricklayer.

Other Awards Made

Other prize awards were as follows: William Bradley, apprentice bricklayer, Marc Eidlitz & Son, Inc., $75; Harry Wenz, carpenter, Chesbro-Whitman Co., Inc., $50; Joseph Crowley, laborer, Thompson-Starrett Co.; Carl G. Almquist, sheet metal worker, Baker Smith & Co., Inc.; Al. Steinhilber, foreman plumber, W. G. Cornell Co.; Louis B. Fassler, ornamental iron and bronze finisher, Fassler Iron Works; Thomas R. Smith, steamfitter, Baker Smith & Co., Inc.; Adam H. Birney, Jr., electrician, Jandous Electric Equipment Co., and Harold Baer, tinsmith, Baker Smith & Co., Inc., $25 each. Additional prizes of $10 each in lieu of honorable mention were given to Emil J. Franz, plumber, J. S. Murphy Co., Inc.; Edgar Allen Crowe, steamfitter's helper, Cascade Automatic Sprinkler Corp.; Julius Reinersen, carpenter, Turner Construction Co.; Augustus Scout, carpenter, Jas. Stewart & Co., Inc.; and Samuel McGarity, brick mason, Chas. T. Wills, Inc.

An English Book on Excavating Machinery

A WELL-KNOWN English expert on excavating machinery, W. Barnes, member, Institute of Mechanical Engineers, of Great Britain, has prepared a book covering excavating machinery as represented by power shovels, draglines and cranes. The opening chapter contains an interesting historical development of each type of machine, both in Great Britain and in the United States. Otis, the son of a contractor, designed and constructed the first steam shovel in 1834. Self-laying or crawler tracks, undoubtedly the most useful detail or accessory ever added to these machines, are modern, but patents for these are traced back as far as 1691 and 1770. The second chapter deals with various types of machines in detail, covering the full-circle shovel or crane, universal or general purpose excavator, combining shovel, dragline, grab, skimmer scoop and trench excavator, the dragline excavator, the long jib full-circle shovel or dragline, the railroad type shovel, clamshell buckets, electrically-operated excavators, internal combustion engine excavators, diesel or oil-electric excavators, hydraulic shovels and air-operated shovels.

Chapters 3 to 8 deal with the main construction features of the various parts of the excavator, applications of the various types of excavating machinery, a chapter prepared particularly for the prospective purchaser, dealing with the various conditions which determine the most suitable type and size of machine, the working height of a shovel, working depths for draglines, output and working costs. The following chapter is for the user, dealing with erection, details of suitable erecting tackle and working costs, together with operating and maintenance hints, repairs and renewals. The next chapter is devoted to the auxiliary plant which includes drilling and blasting, rock breakers or crushers, wagons and their organization, hoppers and chutes. The final chapter contains notes on hand excavation, weights of materials both in place and loose or excavated, angles of repose of various materials, etc.

This book is published by Ernest Benn, Ltd., Bouverie House, London, E.C.4, England. The price is 42 shillings net, and the U. S. customs charge is $1.50.

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LABOUR

Centrifugal Self-Priming PUMPS Handle Heavy Loads and High Lifts in New York Subway Work

THE accompanying photograph shows two LaBour self priming pumps owned by Rosoff Subway Construction Company and operating on a semi-permanent installation on a New York subway construction job. The pumps are taking care of a heavy drainage problem at a point where the natural drainage requirements are complicated by a continuous in-flow of water from above.

Replace Other Makes

So completely do LaBour pumps meet the varied and difficult requirements of subway constructing pumping that they have replaced practically all other makes of pumps throughout the extensive construction work now under way in that vast system.

Meet "Surprise" Conditions

LaBour self-priming pumps are guaranteed to handle 20 ft. lifts on the suction side at or near sea-level. They pump sewage. They take care of sand-and-water lifts. They do not break prime when water supply gives out and air takes its place. They met "surprise" conditions that would throw any other type of pump out of commission.

Unique in Design

No floats or valves are used in LaBour pumps and no external priming devices. Our patented Impeller—the only moving part—together with the casing in which it operates, takes the place of all such complications.

LaBour pumps are offered in a range of sizes, for portable or stationary installations; from our own stocks, or by contractors supply houses.

Send for Bulletin 29-C

THE LaBOUR COMPANY, Chicago Heights, Illinois

Who's Who in Construction

A Series of Reports from Active Contractors Published Monthly

BUS. VOL.—ANNUAL VOLUME OF CONTRACTS
A—Over $5,000,000
B—Between $1,000,000 and $5,000,000
C—Between $500,000 and $1,000,000
D—Between $250,000 and $500,000
E—Under $250,000

Central Bridge & Construction Co., Wahoo, Nebraska, 8th and Chestnut Streets. Organized: January 6, 1917. Bus. vol. C. The Central Bridge & Construction Co., of Wahoo, at the time of its organization, also took over the Wilson Reinforced Concrete Co., of Nebraska City. For five years, this company was retained as a branch office in Nebraska City but in 1922, this office was closed and the equipment was moved to the head office in Wahoo. Officers: E. G. Risk, President and Treasurer; Wilmer G. Johnson, Vice-President and General Manager; M. E. Carman, Secretary. Major contracts: about 50 road contracts with the state of Nebraska, ranging in amounts up to $150,000 and including grading, bridges, culverts and gravel-surfacing. This company also does paving and manufactures reinforced concrete culvert pipe. Member: A. G. C. of A., Mr. Johnson being President of the Nebraska branch, and American Concrete Pipe Association.

FitzGerald Construction Co., Chicago, Ill., 105 West Monroe Street. Organized: May, 1922. Bus. vol. B. Officers: A. J. Fitzgerald, President; J. G. Fitzgerald, Secretary and Treasurer. Major contracts: 1926, Devonshire Apartments; 1927, J. Sterling Morton High School; 1928, Loop Center Build- Corporation. Member: Chamber of Commerce, Chicago, Illinois.

Photo by Blank & Stoller
A. J. FitzGerald

Photo by Blank & Stoller
J. G. FitzGerald

Price-Smith Co., Rockingham, N. C. Organized: February 1, 1925. Bus. vol. E. Officers: R. C. Price and T. T. Smith, partners. Major contracts: 1925, Presbyterian Church, Wagram, N. C.; 1926, 2 school buildings, Richmond County, N. C., Presbyterian Church, Mt. Gilead, N. C.; 1927, Episcopal Parish, Southern Pines, N. C., Congregational Church of Wide Fellowship, Southern Pines, N. C.; 1928, addition to Pee Dee Mfg. Co., unit No. 1, laundry and stores for J. D. Chalk, Rockingham, N. C.

B. A. Groah Construction Co., Pittsburgh, Pa., 847 W. North Ave. Organized: May 28, 1912. Bus. vol. C. B. A. Groah established the firm of Benjamin A. Groah & Bros., as a partnership in 1882, and later reorganized a limited partnership under the name of B. A. Groah Co. In May, 1912, it was incorporated under the laws of the state of Pennsylvania, under the name of B. A. Groah Construction Co. Officers: B. A. Groah, President; A. F. Gass, Secretary and Treasurer; E. H. Langdon, Assistant Treasurer. Major contracts, $4,000,000 plant for Standard Sanitary Mfg. Co., Baltimore; $400,000 office building for Westinghouse Electric Mfg. Co., East Pittsburgh.

E. W. Howell Co., Babylon, L. I., N. Y., 305 Deer Park Avenue. Organized: 1891. Bus. vol. B. This company is a partnership, specializing in the construction of large country residences on Long Island. Officers: Elmer W. Howell, Elmer B. Howell and Ralph D. Howell, partners. Major contracts: residences and surrounding buildings for Harrison Williams, Charles Payson, Benjamin Moore, C. V. Whitney, Charles Pratt, Landon Thorne, Chalmers Wood, Lewis Eldridgee, Harry Guggenheim, Charles P. Wilson, C. N. Bliss, George Whitney, Courtland Barnes, Oliver Iselin, Aurell Jay Carlisle, George Anderson, Ray Graham, E. S. Harkness, Charles F. Hubbs, W. Kingsland Macy and John Slade, the Christ Church, Oyster Bay, Roderic Tower. Member: Long Island Building Trades Employers' Association and New York Building Congress.

E. W. Howell

Leon Swartz, Lewiston, Pa. Organized: 1924. Bus. vol. E. Officers: Leon Swartz, owner. Major contracts: highway projects for the State of Pennsylvania.

O. Almquist, Central City, Nebr., 1508 16th Ave. Organized: Jan. 8, 1910. Bus. vol. E. Officers: Oscar Almquist, owner and general manager. Major contracts: 1927-28: store and office building, Central City, $25,000; laundry building, Central City, $15,000; school, Chapman, $25,000; grade school, Central City, $110,000; high school, Fullerton, $140,000. Member: Nebraska Master Builders.

Freeman & Jones, Inc., Cleveland, Ohio, 5716 Euclid Avenue. Organized: March, 1926. Bus. vol. D. This company is an outgrowth of Lane & Freeman, a company incorporated in 1920 with offices in St. Louis, Mo., and Cleveland, Ohio. Freeman & Jones, Inc., an Ohio corporation took over the assets and business of the Cleveland office. Officers: Carlyle B. Freeman, President; E. W. Jones, Secretary and Treasurer. Major contracts: 1926, sewage treatment plant, Brooklyn, Ohio; 1926-27, sewage treatment plants for Aurora, Ohio, Burton, Ohio, and Cleveland State Hospital; 1928, sewage treatment plants for Geneva-on-Lake, Ohio, and Salem, Ohio, improvement on Union Terminal for Nickle Plate R. R. Co. Member: A. G. C. of A.

Whidden-Beekman Co., Boston, Mass., 100 Arlington Street. Organized: 1915. Bus. vol. B. This company is the successor to Whidden & Co., one of the oldest building contracting firms in Boston. Officers: Robert A. Whidden, President and Treasurer. Major contracts: main generating plant of the Edison Electric Illuminating Co., of Boston at South Boston, and various substations; Straus Dormitory, Harvard University; several mills and factories. Member: Building Trades Employers' Association of Boston; A. G. C. of A.

Photo by Blank & Stoller
R. A. Whidden

Good Roads MACHINERY

Motorized Road Graders—"THE AUTOGRADER" —"THE MOTOGRADER" Motor Road Rollers—Bituminous Distributors—Snow Removal Equipment Rock Crushing Plants, Sand and Gravel Plant Equipment.

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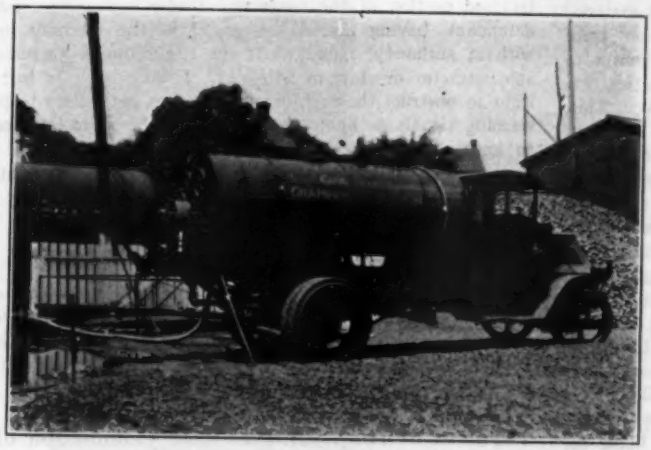
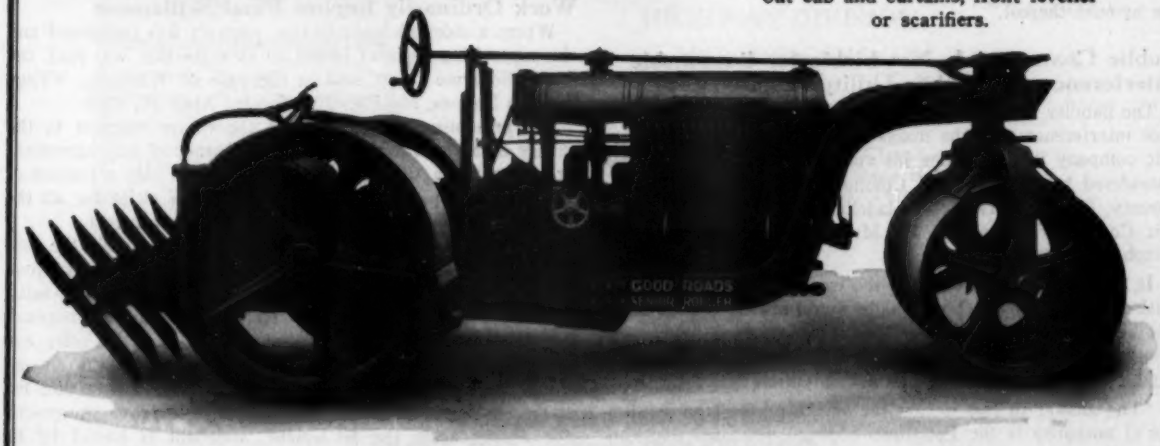
A Mark—denoting machinery of exceptional quality—and embodying the latest engineering principles in design and construction



ABOVE: Motorized Road Graders —The "AUTOGRADER" for general road work and contractors. The "MOTOGRADER"—a heavy-duty grader with tractor power. (Shown above)

AT LEFT: Good Roads CHAMPION BITUMINOUS DISTRIBUTORS — 600-800 and 1000 gallon capacity. Single and double unit types. SIMPLE — SAFE — FLEXIBLE—EFFICIENT.

BELOW: Good Roads SENIOR ROAD ROLLER—Equipped with Pneumatic Scarifier—with or without cab and curtains, front leveller or scarifiers.



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Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Construction Foreman's Implied Authority to Buy Materials

Where a construction company's foreman was authorized to order out materials bought by the company, the Arkansas Supreme Court decided (Feb. 27, 1928) that he had implied authority to have materials charged, (Stewart-McGehee Construction Co. vs. Brewster, 3 S. W., 2d Series, 42.) It was held that a foreman had a right to bind a general contractor by a promise that the latter would pay for materials furnished on a subcontractor defaulting in performance of his agreement. The court said:

"Ingram [the foreman] had authority to order out material as the work progressed, and, in fact, did order same out from time to time as it was needed, and he had implied power to bind appellant [the company] by placing orders for this material, as it was in the apparent scope of his authority. This, too, regardless of the fact that the president of appellant stated that he had no authority to make a contract for the purchase of material, but only to order same out after he had made the contract of purchase. By putting him in charge of the work, with authority to order out the material, he had the implied power to order any necessary material for the building, whether previously purchased by appellant's president or not. . . . Being the foreman of construction, and being on the job all the time, with authority to order out material, it was certainly within the apparent scope of his authority to charge material in the name of Shepherd [the subcontractor] who, it is alleged, defaulted in his contract to plaster the building, for the convenience of appellant in keeping the accounts separate, so that appellant could hold Shepherd's bondsmen liable for the amount thereof."

Public Contractor Is Not Liable for Reasonable Interference with Public Utility's Pipes, etc.

The liability of a sewer contractor for necessary and reasonable interference with the mains and pipes of a gas and electric company in performing his contract with a borough was considered by the Court of Common Pleas for Montgomery County, Pa., in the case of Philadelphia Suburban Gas & Electric Co. vs. O'Donnell, 19 Pa. Mun. Law Rep., 193, decided October 19, 1927.

It was virtually conceded by the company that the borough with which the contract was made would not have been liable for like interference if it had done the work itself, but it was contended that the same immunity did not extend to the borough's contractor. Overruling this contention, the court said:

"The answer to this is that the source of his [the contractor's] authority is the Pottstown borough ordinance and contract, by virtue of which he is its contractor and agent and is enthroned with the same authority as if the borough authorities themselves were constructing the same system. His legal status with relation to the plaintiff is the same as would have been the municipal authorities.' "

But the opinion leaves it clear that, in order to enjoy such immunity, the interference caused by the contractor as to the public utility's pipes, etc., must be both necessary and reasonable.

Placing Gravel in Roadway Without Warning Was Actionable

Holmes was employed by a highway subcontractor to furnish gravel and piled some in the roadway. A passenger in an automobile was injured through the overturning of the machine when it struck the pile of gravel in the night-time. Deciding that Holmes was liable for the accident, the Springfield, Mo., Court of Appeals said in the case of Wilmore vs. Holmes, 7 S. W. 2d series, 410, decided May 24, 1928:

"The evidence of plaintiff . . . showed this gravel was piled to a height of about 2½ feet extending out into the traveled portion of the roadway. Under such circumstances defendant, having placed the gravel in the roadway itself, without authority, cannot shift the responsibility therefor to subcontractor or state of Missouri. Even though he had the right to obstruct the highway temporarily, his failure to place warning signals or lights thereon during the night-time, so as to enable persons exercising ordinary care to discover the danger, was negligence rendering him liable for resultant injury or damage."

Owner's Failure to Pay Instalment Justifies Contractor's Refusal to Proceed

A city having failed to pay a monthly estimate due on a tunnel construction contract, the contractor was justified in refusing to proceed, held the Washington Supreme Court in an opinion handed down March 19, 1928, in the case of City of Seattle vs. Sparger, 265 Pac., 173.

Payment of An Estimate After Completion of Work Ordinarily Implies Final Settlement

Where a sidewalk construction contract was completed and the supervising engineer issued an estimate that was paid, the Idaho Supreme Court said in the case of White vs. Village of Soda Springs, 266 Pac. 795, decided April 26, 1928:

"In presenting the estimate of the village engineer to the village as a claim against it, in the absence of any agreement or understanding that it was an estimate of only a portion of the work, the presumption is that it was a claim for all the work performed by appellant under the contract. . . . And where respondent [the village] allowed and paid the estimate, under such circumstances that both parties understood and intended that the payment was to be full and final satisfaction of appellant's [the contractor's] claim against respondent, we think the final payment amounted to an offer and acceptance of a sum certain in full satisfaction of an unliquidated claim, constituting an accord and satisfaction between the parties. . . . Having failed to prove any ground for setting aside the settlement, appellant is bound by its terms."

Interest on Overdue Estimates

A drainage contractor was held to be entitled to interest on the amount called for by an engineer's estimate from the date demand was made for payment of the estimate, in the case of Clifton, Applegate & Toole vs. Big Lake Drain District No. 1., 267 Pac. 207, decided May 4, 1928, by the Montana Supreme Court.

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THE grind of modern traffic. A traffic never-ceasing—ever-growing. Heavier loads. Greater congestion. Durable indeed must a roadway or pavement be to withstand such burdens. And durable they become through Truscon Highway Reinforcing Products. Truscon Welded Steel Fabric reinforces the concrete to prevent contraction and settlement cracks. Truscon Contraction Joints allow expansion and contraction along definite planes without injury to the pavement. Truscon Road Forms insure accurate and speedy construction of the roadway. Truscon Curb Bars thoroughly protect the concrete curb at its weakest point.

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PRODUCTS FOR REINFORCING ROADS AND PAVEMENTS

Watch Your Step When You Take a Contract for Public Work

Because a drainage and levee district improvement project was being carried out without compliance with statutory provisions the contractor found that its contract was worthless. It happened in the case of Duck Island Hunting & Fishing Club vs. Edward Gillen Dock, Dredge & Construction Co., 161 N. E. 300, decided April 21, 1928, by the Illinois Supreme Court.

The work was being carried out without complying with Illinois statutes providing for the approval by the State Department of Public Works and Buildings of works to be constructed in public waters within the state. Holding that the contract was void, the court observed:

"At the time the supposed contract of the drainage district in this case with the . . . Construction Co. was made the statutes above quoted were in force and effect, and that company is presumed to have known their provisions, and to have had knowledge of the limitations of the power of the district to contract."

Contractor Is Not Liable for Damages That Could Not Be Foreseen as a Result of a Change of Construction Detail

A contract to install a sprinkler system in a building contemplated a high and narrow tank, but a low and broad one was erected. The owner claimed damages because of being prevented from utilizing the exterior of the tank for advertising purposes. Said the Louisiana Supreme Court in an opinion handed down January 18, 1928, in the case of Rockwood Sprinkler Co. vs. Johnson, 115 So., 491:

"In our opinion this is a mere afterthought, and cannot 'reasonably be supposed to have entered into the contemplation of the parties at the time of the contract. . . . If defendant did have any such thought in mind, he should have communicated it to plaintiffs, to the end that they might know that the work which they were about to do must answer not alone the purpose which they know of, but also another and very different purpose which this defendant particularly desired, though not mentioned."

The opinion treats the tank constructed as fully serving the main purpose for which it was designed.

Crediting Payments as Between Different Accounts

In the case of Delaware Dredging Co. vs. Tucker Stevedoring Co., 25 Fed. (2d) 44, decided by the United States Circuit Court of Appeals, Third Circuit, March 15, 1928, the court drew attention to the following stated rules of law applying to cases where a debtor owes more than one debt to a single creditor and makes a payment:

"A debtor may control the application of his payments. If he fails to make the application, the power to do so devolves upon the creditor. If neither does so, it becomes the duty of the court to make the application, and in doing this it must be guided by a sound discretion. It is equitable that the entire debt be paid. Equity and wise discretion require that the court should apply such a payment to the debt for which the security is most precarious and to unsecured debts. . . . Courts, in their effort to administer law and equity wisely, have established another rule, which has become general: When a payment has been made on open, running accounts, and has not been applied to any particular account by either debtor or creditor, the court will apply it to the coldest account. Sometimes this rule runs counter to the rule that the payment should be applied to the unsecured rather than the secured debt. In such cases the rule requiring the payment to be applied to the oldest debt prevails. . . . Especially is this true when, as here, the application of this latter rule also favors the creditor. The accounts to which the court applied the two payments in question were both oldest and unsecured."

A Contractor Bore the Risk of Encountering Unforeseen Obstacles

Where a contract to construct wharves was awarded by a city the existence of submerged log inbedded in the bottom of a river at the site, causing the contractor difficulties not foreseen by him, did not constitute a breach of the contract on the part of the city, declared the Texas Court of Civil Appeals in the case of Hill vs. City of Beaumont 5 S. W. (2d) 590, decided March 30, 1928.

The contract contained the following clauses:

"(a) Bidders are expected to inspect the site of the work and to inform themselves regarding all local conditions.

"(b) All loss or damage arising out of the nature of the work to be done, or from the action of the elements, or from any unforeseen circumstances in the prosecution of the same, or from unusual obstructions or difficulties which may be encountered in the prosecution of the work shall be sustained and borne by the contractor at his own cost and expense."

The court said: "Under condition (a) the Houston Construction Co., was required to inspect the site of the work and to inform itself regarding all local conditions. The troubles encountered by it in the execution of the work arose from a local condition of which it could have been fully advised on inquiry. It was pleaded that the site was the seat of an old sawmill. This could have been discovered by inquiry. It is a matter of common knowledge that sawmill logs are necessary for sawmill, and that everything found at the site of the work constituting the alleged hindrances and obstructions to the execution of the work inherently exist at the site of an old sawmill. Inquiry by the Houston Construction Co., under the terms of the contract would have so informed it, and it was therefore required to take notice of the very conditions now complained of. Section (b), as given above, also protects appellee [the city] fully from liability. If appellant [the contractor's trustee] was not required to take notice of these conditions under section (a), and if the borings as actually made did not reveal the sunken logs, then their presence at the site of the work was an 'unforeseen circumstance in the prosecution of the same' or constituted unusual obstructions or circumstances encountered in the prosecution of the work. Therefore, by said section (b), these logs were a burden on the Houston Construction Co., expressly assumed by the conditions of the contract as fully as if reflected by the plans and specifications. The plans and specifications detailed the depth to which the piling was to be driven, and the Houston Construction Co., contracted to drive the piling to that depth, notwithstanding the 'unusual obstructions or difficulties' which it might encounter in the prosecution of the work. That the city engineer required the Houston Construction Co., to comply with this condition of the contract did not constitute bad faith on his part, nor a breach of the contract."

Variation in Name Was Not Fatal

That a contract was inadverently signed "H. W. Underhill & Co., the name of a partnership that had been succeeded by a corporation named "H. W. Underhill Construction Co." did not make it any the less the contract of the corporation, according to the view taken by the Kansas City Court of Appeals in the case of Underhill Construction Co. vs. Nilson, 3 S. W. 2d Series, 399, decided March 5, 1928. Said the court:

"The general rule is that a corporation must take contracts in its corporate name. However, there is an exception to this rule in that a misnomer of the corporation will not affect the validity of its contracts."

The opinion recognizes the general rule of law that even a contract taken under an assumed or fictitious name may be enforced. So, if John Doe were to enter into a construction contract using the name Richard Roe for the one and only time of his life, the contract would be enforceable by or against him on proof of the identity.

DODGE BROTHERS

ANNOUNCE

The complete line of Trucks, Buses and Motor Coaches which Dodge Brothers have been manufacturing and selling under the name of Graham Brothers now take the name of their makers—Dodge Brothers.

These Trucks, Buses and Motor Coaches have always been powered by Dodge Brothers engines. For years they have been built of Dodge Brothers parts in Dodge Brothers plants according to Dodge Brothers standards.

These Trucks, Buses and Motor Coaches are sold, as they always have been sold, by Dodge Brothers Dealers everywhere.

For Power, Speed, Safety, Economy, Fine Appearance and Dependability, Dodge Brothers Trucks, Buses and Motor Coaches will continue to merit that high public regard which impels keen businessmen to buy them at a rate of more than a million dollars' worth a week.

DODGE BROTHERS TRUCKS

BUSES AND MOTOR COACHES

Construction Industry News

McEverlast, Inc., 111 West Seventh St., Los Angeles, Cal., has announced that Lee S. Trainor, formerly manager Highways and Municipal Bureau, Portland Cement Association, has been appointed district manager for McEverlast, with offices at 952 Pure Oil Building, Chicago, Ill. The Chicago office, under the direct personal supervision of Mr. Trainor, will cover Ohio, Indiana, Kentucky, Illinois, Iowa, Wisconsin, Michigan, Minnesota, Nebraska and North and South Dakota.

Lee S. Trainor

The Caterpillar Tractor Co., San Leandro, Calif., has recently acquired the business and facilities of the Russell Grader Co., of Minneapolis, Minn. The Russell line of road building machines will in the future be manufactured at the plant in Minneapolis which will now be known as the Road Machinery Division of the Caterpillar Tractor Co. Caterpillar dealers throughout the country will handle the Russell line and also the Holt combined harvesters, which are being manufactured at the Harvester Division of the Caterpillar Co., located at Stockton, Calif. The Caterpillar Co., recently announced its intention of building a new eastern combined harvester factory at Peoria, Ill., where its principal tractor factory is now located.

The Trackson Co., Milwaukee, Wis., has announced that the Browning-Ferris Machinery Co., 205 Exposition Ave., Dallas, Texas, will handle the distribution of Trackson equipment for McCormick-Deering tractors. The distributors will have the entire state of Texas and maintain branches in Houston, Fort Worth and Amarillo. They are at present authorized distributors for McCormick-Deering tractors and are in a position to give quick service on International and Trackson lines.

The Chain Belt Co., Milwaukee, Wis., has recently announced the appointment of W. B. Marshall as Sales Manager of the Contract Engineering Department. He has been associated with the company since 1921, spending some time in the Chicago office.

The Otis Engine Corp., 130 Clinton St., Brooklyn, N. Y., has announced the appointment of Edwin F. Daley as Vice-President and General Manager.

The American Steel & Wire Co., 208 South La Salle St., Chicago, Ill., has announced the appointment of Wilmer H. Cordes as Manager of the Advertising Department. The responsibilities of the Advertising Department have rested on Mr. Cordes since the retirement of Mr. Ayers and the creditable manner in which he has handled his duties has justified this recognition.

Dodge Brothers, Detroit, Mich., has entered the heavier truck field and all trucks formerly known as Graham Brothers trucks will now be designated as Dodge Brothers trucks, including the entire line of busses and motor coaches built by this company.

The Continental Motors Corp., Muskegon, Mich., has announced the appointment of Sid Harris as Industrial Sales Engineer in the East. Mr. Harris comes to Continental with a wide knowledge of the industrial field, his past experience including market research, sales promotion and sales engineering.

Joe L. Long, well known in the road machinery field from coast to coast, is representing E. D. Etnyre & Co., Oregon, Ill., in Chicago, at 222 West Adams Street.

The Dow Chemical Co., Midland, Mich., informs us that Donald Williams has been appointed Assistant Sales Manager, to succeed S. W. Putnam, whose resignation was accepted December 31.

Foote Brothers Gear & Machine Co., 215 North Curtis St., Chicago, Ill., has announced that it has acquired interest in four well-known manufacturing companies specializing in the manufacture of highway and road building equipment as follows: Lyle Culvert & Road Equipment Co., Minneapolis, Minn.; Stockland Road Machinery Co., Minneapolis, Minn.; Northwestern Steel & Iron Corp., Minneapolis, Minn.; and Bates Manufacturing Co., Joliet, Ill. It is reported that the personnel and organizations of all the new plants will be retained while the general and executive offices will be in Chicago under the direction of W. C. Davis, President. The activities of Foote Brothers in the gear and speed reducer field will remain unchanged and they will continue to manufacture IXL gears and speed reducers.

The Eastern Paving Brick Manufacturers Assn., has announced the removal of its offices to 1535 Real Estate Trust Bldg., Philadelphia, Pa. William C. Perkins is Chief Engineer of the Association.

The Cincinnati Car Co., Winton Place Cincinnati, Ohio, has announced that it has begun the manufacture and sale of industrial locomotives in gasoline, gasoline-electric, diesel, electric trolley and storage battery locomotives known as the Cincinnati line.

Hazen, Everett & Pirnie is the new name of the well-known firm of consulting water supply engineers, Hazen & Whipple with offices at 25 West 43rd St., New York.

The Gustav Schaefer Wagon Co., 4180 Lorain Ave., Cleveland, Ohio, has changed its name to the Gustav Schaefer Co., since the wagon end of the business has become rather obsolete.

Fuller & Johnson Mfg. Co., Madison, Wisconsin, has announced that control of the company has been purchased by the Second Ward Securities Co., and the Quaries Co., of Milwaukee. The company has been reorganized, and additional capital has been supplied but the officers of the company remain unchanged. It is announced that no merger of the company is involved. Operations will be carried on entirely independent of the Waukesha Motor Co., as the two companies manufacture non-competing lines, the Fuller & Johnson Co., making motors from 1- to 20-h.p. while the smallest motor made by the Waukesha Motor Co., is 25-h.p.

The Stoddard-Dick Co., 620 Polk Bldg., Detroit, Mich., has opened an office at 301 Rose Bldg., Cleveland, Ohio, with Carter G. Swift in charge. This company specializes in the manufacture and distribution of items used in the erection of forms for concrete either in reinforced concrete buildings or steel frame buildings for concrete fireproofing. They represent the Universal Form Clamp Co., Chicago, Ill.; Symon Clamp & Mfg. Co., Chicago, Ill.; and the Union Steel Products Co., Albion, Mich.

63

2½ Million Sq. Ft. Paving Job being Cured by *Hunt Process**

EAST SIDE Paving Project, city of Ventura, one of the largest single paving jobs ever let in California! And the contractors are depending on the Hunt Process to do the curing—typical of the recognition which this improved method is receiving! The largest paving contractors in many states depend on the Hunt Process for curing their biggest jobs. They were not swayed by opinions. Results convinced them!

Hunt Process used in more than 325 jobs from Washington, D. C., to Honolulu and not a single failure. Makes concrete 8½% stronger than that cured by "ponding." (Comparative tests of 296 cores determined this.)

Allows opening the road to foot traffic in 48 hours—light auto traffic in 7 days—heavy traffic in 12 days. No dirt to spread on and take off! No mud or dust to spoil nearby buildings. These are a few of its advantages. The superiority of the Hunt Process to other methods of cure has been proven through severe tests made by state, county and city engineers and other impartial investigators. Ask for our illustrated booklet — "Curing Concrete Without Dirt and Water by the Hunt Process." Gives details of tests and other important data.

*Recently, a section of California State Highway opened to heavy traffic in 7 days through use of Hunt Process and slight increase of cement content.

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National Road Show
Visit our Booth No. AH-1 on the Arena Floor of the Cleveland Public Auditorium, at the National Road Show. Movies of actual jobs! Attractive displays. Important information!

Road Show Notes

Allis-Chalmers Mfg. Co., Milwaukee, Wis., will feature an operating exhibit of the Newhouse Style-B rock crusher for high capacity and low crushing costs. The company will be represented by H. Schifflin, Manager, Crushing and Cement Division; R. C. Newhouse, Chief Engr.; C. R. Beck, Sales Engr.; G. W. Shores and A. Goldberg of Milwaukee; W. E. Keine, New York; J. M. Johnson, Chicago; and A. H. Wyman, Manager, J. T. Mueller, V. E. Walters, W. F. Sheriff, F. A. Miller and M. V. Bailliere of the Cleveland Office.

American Steel & Wire Co., 208 South La Salle St., Chicago, Ill., will exhibit at Space AA-61, concrete reinforcement fabrics, triangular mesh and electric weld for reinforcement of streets and highways, steel posts for highway signs and snow fences, American wire rope and perfected highway guard cables. Those in attendance will be B. S. Pease, O. T. Allen, P. T. Coons, H. D. Worthington, H. E. McCann, R. C. Pierce, C. T. Gilchrist, D. E. Hinman, R. C. Groesbeck, A. T. Merriman, W. H. Cordes and R. E. Francisco.

Anthony Co., Inc., Streator, Ill., will exhibit dump bodies for light duty trucks, including the Roller Rocker gravity line and the new rotating power driven hoist. The exhibit will be in Booth 61, West Wing, and will be attended by W. C. Anthony, President, R. R. Howard, Sales Manager, W. B. Tomlinson, J. H. Monning, E. S. Kriegh, E. L. Flanigan and C. F. Hartman.

Armco Perforated Pipe

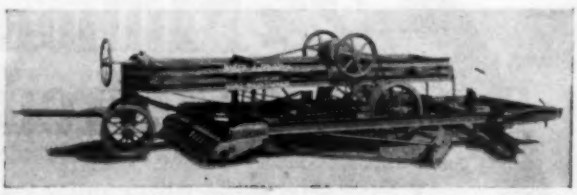
Armco Paved Invert Culvert

Installation of Armco Perforated Pipe in Landslide Prevention Project in West Virginia

The Armco Culvert Manufacturers Assn., Middletown, Ohio, will feature Armco perforated iron pipe at its exhibit at Booth EH-17 in charge of Anton S. Rosing, assisted by W. F. Moehlman, J. S. Neibert, T. N. Neibling, H. J. McKeever, W. H. Spindler and Dr. G. E. Ladd.

The Austin-Western Road Machinery Co., 400 North Michigan Ave., Chicago., will exhibit seven pieces of equipment including the Austin dual drive motor grader with McCormick-Deering 10-20 power plant, the new Austin Cadet 5-ton pup sized roller, the Western 5-yard crawler wagon, the 10-ton Austin Autocrat roller, the Austin Mammoth Senior leaning wheel grader with Rip-Snorter scarifier, the Western No. 55 grader with scarifier and the Western motor grader attachment for the No. 20 Cletrac with front scarifier and cab. The exhibit will be in charge of William Cornwell.

The Autocar Co., Ardmore, Pa., will exhibit the Good Roads-Clinton concrete carrier mounted on a standard 5-ton, 6-cylinder Type C. M. Autocar chassis, an Autocar Trailblazer, and a 3-ton truck.



The Baker One Man Automatic Road Maintainer with Scarifier Attachment

The Baker Manufacturing Co., Springfield, Ill., will exhibit Baker-Maney scrapers, the Baker one-man automatic road maintainer, one-man automatic rotary scrapers, and several types of Baker snow plows in Space WW-81 in charge of J. G. Miller, Vice-President and Sales Manager.

The Bakstad Crusher and Equipment Corp., 122 South Michigan Ave., Chicago, Ill., will exhibit a Bakstad patented three-jaw rock crusher in Space SEH-2.

Barber-Greene Co., Aurora, Ill., will exhibit the new Barber-Greene excavator, the B-G belt car unloader, the B-G vertical boom ditcher and also its bucket loader in Space WW-25 and 35.

Blaw-Knox Co., Pittsburgh, Pa., will exhibit a 51-ton all-steel portable, two compartment bin with double weighing batcher, an agitator truck body mounted on a high lift hoist and operated by an electric motor, Dreadnaught road forms, Universal forms for sidewalks, curbs, integral curbs, curb and gutter, etc., the Blaw-Knox Triplex gate for three-compartment bins, a one-yard inundator and water measuring equipment, an electro-forge grating for stair treads and a dragline bucket.

Bucyrus-Erie Co., Erie, Pa., will exhibit a one-yard Gas+Air Bucyrus-Erie shovel, a one-yard diesel D-2 machine equipped with a drag shovel or hoe, a one-yard D-2 steamer shovel and the new one-half yard Bucyrus-Erie 1020 at Booth AA-20 in the Arena in charge of J. A. Garber, Assistant General Sales Manager with John T. Miller, General Sales Manager and W. F. Bager, Vice-President in attendance.

65

In PHILADELPHIA

Solvay Calcium Chloride was used in the construction of the Elverson Building, home of the Philadelphia Inquirer. Architects, Rankin, Kellogg & Crane. Contractors, Roydhouse & Arey.

EVERYWHERE leaders of the building field recognize the value of the economies effected in concrete construction by the use of Solvay Calcium Chloride.

In cement finishing alone, the amount Solvay Calcium Chloride adds to profits through time and labor saved is enough to dictate its use.

With many leading builders the use of Solvay Calcium Chloride is a standard practice of floor finishing. On the floor finishing work in the Park Square Building in Boston enough overtime was eliminated by the use of Solvay Calcium Chloride to save $6,000 for the contractors.

It will pay you to consider the facts contained in the booklet, "Solvay Calcium Chloride in Concrete Construction." Write today for your copy.

Ask for Booklet 2053

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

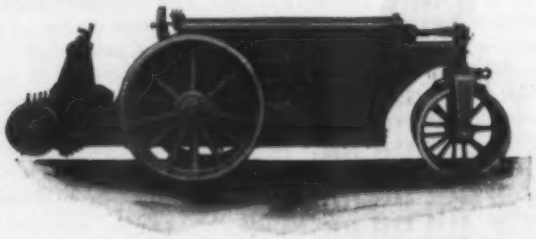
40 Rector Street, New York

SOLVAY
Calcium Chloride

Flake 77%—80%

Manufactured under United States Patents No. 1,527,121 and No. 1,592,971

The Buda Co., Harvey, Ill., will exhibit the Buda M.A.N. high-speed light weight diesel engine of the 4-cylinder, 6 x 8-inch type developing 92 horsepower at 1,000 r.p.m. and also a 6-cylinder 180-horsepower diesel, as well as several models of gasoline engines and gasoline power units. The exhibit will be in charge of R. K. Mangan, assisted by A. F. Ochtman, G. H. Earle, L. H. Earle, L. G. Shoemaker and R. L. Goltz.



A Buffalo-Springfield Gasoline Motor Driven 3-Wheel Roller

The Buffalo-Springfield Roller Co., Springfield, Ohio, will show its smallest gasoline motor-driven tandem roller weighing about 2 tons, a 10-ton heavy duty motor-driven tandem, a 3-wheel motor-driven roller for heavier scarifying and a 5-ton unit equipped with grading blade and scarifier. The exhibit will be in charge of W. J. Hazeltine and W. H. McClenen.

Butler Bin Co., Waukesha, Wis., will exhibit a 40-cubic-yard 2-compartment bin equipped with a set of weighing hoppers, featuring the Butler all-steel scale measuring hoppers and different types of bin gates at AA-18 in the Main Arena in charge of M. R. Butler, A. R. Morton, C. E. Riblet and M. A. Kelley.

Caterpillar Tractor Co., San Leandro, Calif., and Peoria, Ill., will exhibit the new Model Ten, the smallest of the Caterpillar family, a standard and a Snow Special Sixty, a standard and a Snow Special Thirty, a standard 2-ton and a Twenty. H. H. Chambers will be in charge of the exhibit.

The Chain Belt Co., Milwaukee, Wis., will display its line of Rex concrete mixers, pavers, pumps, saw rigs, plaster and mortar mixers, contractors' elevators and construction equipment in Space WW-62, in charge of B. F. Devine, Sales Manager.

A Chausse Street Repair Outfit at Work in Washington, D. C.

Chausse Oil Burner Co., Elkhart, Ind., will exhibit its Model E-3 portable asphalt plant and a full line of Chausse oil-burning equipment, including tar kettles, concrete mixer heaters, self-heating smoothing irons, kerosene torches and a oil-burning tool heater and surface heater. The exhibit at Space EH-38-45 will be in charge of W. McK. White, assisted by M. R. Elliott.

Chicago Automatic Conveyor Co., Cicero, Ill., will exhibit a portable belt-type conveyor equipped with a double deck shaker screen for the separation of three sizes of material, as well as a new improved all-steel ball-bearing conveyor idler in Space EH-33 in charge of H. H. Dreyer, Sales Manager.

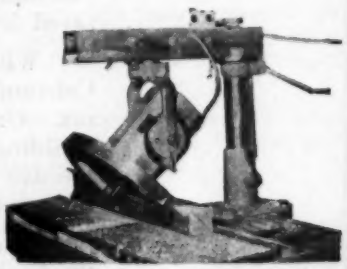
Chisholm-Moore Hoist Corp., Cleveland, Ohio, will exhibit a complete line of chain hoists, electric hoists and I-beam trolleys.

Cincinnati Car Corp., Winton Place, Cincinnati, Ohio, will exhibit two gasoline-powered industrial locomotives, which it has recently developed.

Cleveland Tractor Co., Cleveland, Ohio, will exhibit Cletrac 20, 30, 40 and 100 models as well as a cut out chassis, Model 40. One of the buildings of the company in Cleveland will be set aside as an exhibit of all kinds of road construction, maintenance and contractors' equipment such as is used with tractors generally. A buffet lunch will be served at the plant throughout each day of the show and free busses provided to take visitors to the factory and return them to the Road Show. Exhibit Space WW-89 has been allotted to the Cleveland Tractor Co.

Continental Motors Corp., Detroit, Mich., will exhibit Model H-24 of the new series of 4-cylinder, slow-speed type heavy duty industrial engines, as well as Models 31-R, B7, S5, P20A, P11, P10A and P35A. The exhibit in Space AA-43 will be in charge of L. J. Kanitz, Industrial Division Manager, assisted by Ray Long, Arch Smith and Steve Evelyn of the Sales Department, and Arch Sampson, A. D. Chandler, Stewart Nixon and Sid Harris, industrial engineering representatives.

DeWalt Products Co., Leola, Lancaster County, Pa., will exhibit the new DeWalt band saw and the DeWalt mortizer at Space ES-9 in charge of Paul Gardner, assisted by L. J. McLaughlin, Ohio District Manager.



A De Walt Woodworker

Dodge Brothers, Detroit, Mich., will exhibit a chassis fitted with a three-way dump body and another chassis equipped with a Heil body and snow plow.

Endicott Forging & Mfg. Co., Inc., Endicott, N. Y., will exhibit steel drop forgings used in the manufacture of road rollers, tractors, road scrapers, snow plows and other kindred road machine products at Space SEH-20 with S. J. Marshall, President, T. B. Kelday, Vice-President and Superintendent, R. B. Baker and George B. Reed, in attendance.

Erie Malleable Iron Co., Erie, Pa., will exhibit a complete line of Erie single pneumatic and dual pneumatic tired wheels and the new dual wheel for the Ford truck.

Erie Steel Construction Co., Erie, Pa., will exhibit its new volume weighing AggreMeter which is a radical change over its earlier AggreMeter plants.

BALANCED DESIGN

Why do your shoes have soles?

Shoes are soled because the bottom gets the heaviest wear—it is a matter of balanced design.

Investigation of thousands of culverts has proved the bottom of the culvert is subject to Nature's greatest destructive force—erosion.

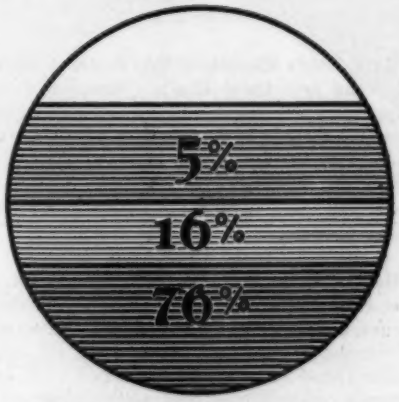
Now Armco Culverts provide protection against this greatest cause of culvert failure . . . literally, the culvert is paved where the wear is hardest.

Get all the facts about the balanced design of Armco Paved Invert Culverts. Our Bulletin H 33 mailed on request.

Forty manufacturing plants throughout the United States and Canada assure you immediate service on drainage requirements, no matter where you may be

ARMCO CULVERT MANUFACTURERS ASSOCIATION
MIDDLETOWN, OHIO

Thousands Inspected tell you this



½ to ¾ of the culvert affected by erosion in 5%*
⅓ to ½ affected by erosion in 16%*
The bottom third or less affected by erosion in 76%*

The conclusion—pave the invert and save the culvert.

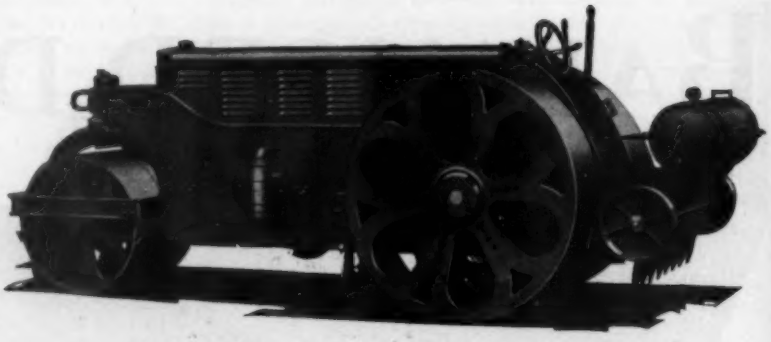
* This data was obtained from investigation of several thousand culverts in actual service. The culverts investigated include all types and materials

ARMCO PAVED INVERT CULVERTS

©1929, A. C. M. A.

E. D. Etnyre & Co., Oregon, Ill., will exhibit its new tank car heater as well as an 800-gallon Etnyre Model F asphalt distributor mounted on a Diamond-T chassis at booth WW-6.

The Fafnir Bearing Co., New Britain, Conn. will exhibit a complete line of ball bearings for road building and contracting machinery in Space SEH-4. Representatives in attendance will include M. Stanley, President, D. L. Holbrook, Engineer, C. W. Kramlich, Sales Engineer, Milwaukee territory, S. M. Cooper, Advertising Manager, and E. B. Hand, Manager, Cleveland office.



A 10-Ton Motor Roller with the New Huber Scarifier

The Fate-Root-Heath Co., Plymouth, Ohio, will exhibit one 25-ton Plymouth diesel locomotive, an 8-ton Plymouth gasoline locomotive and a 5-ton Plymouth gasoline locomotive in Booth WW-63. Representatives in attendance will be E. W. Heath, J. L. Smith, F. B. Carter, H. A. Bergert, A. E. Ainley, C. E. Heath and George G. Stein.

Galion Iron Works & Mfg. Co., Galion, Ohio, will exhibit several new developments in road rollers and road graders at Section WW-5 in the West Wing.

The Geneva Metal Wheel Co., Geneva, Ohio, will exhibit a large varety of metal whels for road construction equipment, with both steel rims and rubber tires, as well as Geneva high test roller bearings.

Good Roads Machinery Co., Kennett Square, Pa., will exhibit the new Good Roads Champion distributor for the application of asphalt and tar products, a Model 10-C Champion snow plow equipped with Good Roads-Westinghouse pneumatic lifting device, the new Type Y-75 Good Roads motor grader and a quarter-size working model of the Champion No. 1030 roller bearing reduction crusher at Space WW-61.

George Haiss Mfg. Co., Inc., New York, will exhibit the new Haiss excavator and road grader, a Model 27 creeper-mounted truck loader, equipped with a 41-horsepower Waukesha engine and stone strike-off hopper, the latest model Haiss snow loader, equipped with a gooseneck type elevator, digging elements and a clean-up scraper, a belt conveyor for handling wet concrete, a Hi-Power digging bucket, and a Haiss lever arm bucket.

Hamilton Mfg. Co., Two Rivers, Wis., is to display several of its drafting room tables, vertical plan files with filing space for rolls of tracings and a drafting desk.

The Heil Co., Milwaukee, Wis., will exhibit its new Heil No. 1 Junior hoist and a Heil hydraulic Hi-Lift hoist as well as steel dump bodies, mechanical hoists and the Gettleman Hi-Speed snow plow in Space WW-71.

Highway Service, Inc., New Bedford, Mass., will exhibit its Big Sandy and Handy Sandy Automotive Equipment for sanding asphalt road construction at Space ES-15. It will also have a demonstration every day on 3rd Street.

The Huber Mfg. Co., Marion, Ohio, will show a 10-ton motor roller, a 5-ton motor roller and a road tractor mounted on rubber tires, as well as a new scarifier which has been designed for the 10-ton roller and which is shown for the first time at the Show. The exhibit will be located in Space 56 in the West Wing.

The Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill., will exhibit the new Thor 250-foot portable air compressor and a complete line of contractors' pneumatic tools, including paving breakers, clay diggers, sheeting drivers, backfill tampers, ripping hammers, chipping and calking hammers at Booth EH-43 in charge of M. J. Sharkless, R. S. Cooper, Vice-President and General Manager, Chicago, and R. T. Scott, Vice-President, New York.

Indiana Truck Corp., Marion, Ind., will exhibit five different models of Indiana Roadbuilders with special bodies and equipment for road building and maintenance work in Space WW-69. The exhibit will be in charge of H. K. York, Vice-President, assisted by E. B. Sinclair, Hoyte Summerland, C. B. Summerland, R. C. Gardener and F. J. Fowler.

Industrial Brown Hoist Corp., 4403 St. Clair Ave., Cleveland, Ohio, will exhibit a Type CC half-yard gas shovel-crane and a new model Topping Pony ditcher with crawler type traction.

The New Koehring 27-E Paver

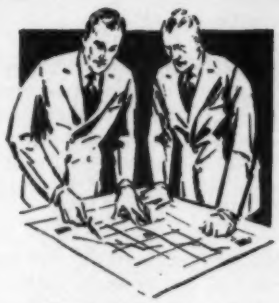
The Koehring Co., Milwaukee, Wis., will exhibit the entirely new Koehring 27-E paver, a 501 shovel with 1¼-yard dipper and 16-foot dipper stick, and a 10-S Dandie two-bag mixer at Space WW-28.

The John Lauson Mfg. Co., New Holstein, Wis., will exhibit its new vertical engine for the first time in Space EH-39-44.

Link-Belt Co., Chicago, Ill., will exhibit for the first time a heavy-duty ¾-yard crawler shovel-crane-dragline known as the K-25, a Type K-55, 2-yard heavy-duty shovel and a new Link-Belt grizzly crawler loader at Space WW-9.

Lycoming Mfg. Co., Williamsport, Pa., will exhibit a C4WM 4 x 5, 4-cylinder gasoline engine, a 4SLM 3¼ x 4½, 6-cylinder engine, and a TS 3⅞ x 5, 6-cylinder motor.

ROADS *into and out of the* sky



Put it up to the Tarvia Man

Here's 1929 — plans, ways, means, construction and maintenance, purchase and delivery, to be undertaken all over again.

And Barrett is ready. Ask the Tarvia field man to show you what Tarvia can do for you this year. Wire, write or phone—for action.

The Barrett Company

New York	Chicago	Philadelphia
St. Louis	Minneapolis	Boston
Detroit	Cleveland	Birmingham
Buffalo	Kansas City	Columbus
Providence	Syracuse	Milwaukee
Baltimore	Toledo	Cincinnati
Lebanon	Youngstown	Rochester
		Bethlehem

In Canada:
THE BARRETT COMPANY, Ltd.
Montreal, Toronto, Winnipeg, Vancouver

TO do what is expected of them, airports must be located near as many good roads as possible. Today, aviation boosters are demanding roads that will make aviation accessible to everyone, *everywhere.*

Tarvia construction will provide these roads at a cost reasonable enough to permit any community to have all the good roads it needs. Tarvia maintenance will keep them top-notch—rutless, stormproof, smooth and skid-safe—indefinitely and economically.

Tarviate your approach roads; Tarviate your airports —and give your fliers and your people a smooth path into the sky.

Tarvia
For Road Construction Repair and Maintenance

The Marion Steam Shovel Co., Marion, Ohio, will exhibit a diesel-electric 1¼-cubic yard shovel and in addition under its subsidiary, **Marion Motors, Inc.**, will show a new fuel-oil engine in charge of C. H. Gibbons.

McEverlast, Inc., 111 Seventh Street, Los Angeles, Calif., will have an extensive exhibit of the Hunt process for curing concrte by use of an asphalt coating sprayed on the surface immediately after finishing. The exhibit will be in charge of Lee S. Trainor, Chicago District Manager, at Booth AH-1.

Metalweld, Inc., Philadelphia, Pa., will exhibit a Metalweld-Worthington 330-cubic foot Air King compressor on rubber tired wheels, as well as a 110-cubic foot Air King equipped with an electric starter, a cross-cut section of a 110-cubic foot compressor, the new 28-cubic foot paint spraying outfit, electrically driven, and a new McCormick-Deering 160-cubic foot tractor compressor, in space ES-21. They will also have a portable 210-cubic foot compressor attachment on a Model-40 "Cletrac" at the exhibit of The Cleveland Tractor Co.

The Osgood Co., Marion, Ohio, will exhibit a part of its Conquest line, and for the first time will show the Commander, as well as the Conqueror and Victor excavators. The exhibit will be in Space AA10, in charge of Earl C. Smith.

Perfex Corp., Milwaukee, Wis., will exhibit a complete line of radiators at its booth in the Esplanade which will be in charge of Roger Birdsell, Vice-President and Sales Manager, A. C. Owen, Cleveland representative, and R. W. Wilson.

The New Perfex Tubular Core Radiator

Ransome Concrete Machinery Co., Dunnellen, N. J., will exhibit a Ransome 27-E Master paver and one of the popular sizes of portable mixers used in the building field. The exhibit at Booth WW-103 will be in charge of A. P. Robinson, Sales Manager, J. M. Trevor, Field Manager of Sales, and A. W. Wilson, Advertising Manager.

Relay Motors Corp., Lima, Ohio, will exhibit Relay motor trucks at Space WW-91.

W. A. Riddell Co., Bucyrus, Ohio, will exhibit its line of Warco road building, snow removing and earth moving machinery. New rear crawlers for tractors and motor graders will be shown for the first time, in its exhibit at Booth WW-99 with Geo. M. Schmidt, General Manager, N. E. Jersey, Sales Manager, F. F. Hughes, Asst. Sales Manager, and Robert N. Schaefer, Advertising and Publicity Manager in attendance.

Rogers Brothers Corp., Albion, Pa., will display four trailers of various sizes and shapes including a 6-wheel 20-ton trailer, a 5-ton 8-wheel trailer and a special girder type trailer adapted for use in localities where exceptionally low bridges are encountered. The display at Booth AY-30 will be in charge of Charles A. Rogers, President, assisted by Louis J. Rogers, Vice-President, and Hugh L. Rogers, Secretary.

The Russell Grader Mfg. Co., Minneapolis, Minn., recently acquired by the Caterpillar Tractor Co., will exhibit the famous Russell line of road building and maintenance equipment. The Russell exhibit will face the Caterpillar exhibit.

Sauerman "Crescent' Power Drag Scraper Bucket

Sauerman Brothers, Inc., 438 South Clinton St., Chicago, Ill., will feature a working model of a Sauerman slackline cableway and Sauerman power drag scraper as well as a small-size Crescent power scraper bucket, a small Universal cableway bucket and a Durolite sheave block at Booth EH-62 in charge of J. L. Mellis, assisted by D. D. Guilfoil, Sales Manager, F. A. Pement, J. A. Schultz, R. H. Baughman, L. E. Dierks and G. E. Gates.

The Sidney Steel Scraper Co., Sidney, Ohio, will show the new patented Perry automatic dump truck body in conjunction with its exhibit of drag and wheel scrapers, wheelbarrows, grading plows and road levelers, held in conjunction with the **Perry Co.** exhibit.

S. K. F. Industries, Inc., New York, will show a replica of a Giant SKF ball bearing as well as actual types of SKF ball and roller bearings in motion, including parts of road building machinery, equipped with these bearings. At the exhibit in Booth SEH-40 will be C. H. De Mott, R. R. Hirsch, J. B. Castino, W. F. Temple, R. R. Zisette and R. S. Smith.

The T. L. Smith Co., Milwaukee, Wis., will show a 27-E Smith paver as well as one of the latest Model Smith 7-S non-tilting mixers.

Southwark Foundry & Machine Co., Philadelphia, Pa., will exhibit a 60,000-pound Emery testing machine equipped with a new form of Brown recorder for an entirely automatic record, a cartridge telemeter, a Whittemore strain gage, Beggs deformeter and a Huggenberger tensometer, will also be shown.

Speeder Machinery Corp., Cedar Rapids, Iowa, will exhibit a Speeder dragline and shovel bucket as well as the Speeder convertible excavator at its Space AA-24. Those in attendance will be George T. Ronk, President and General Manager; Carl Monroe, Vice-President and Treasurer; T. M. Deal, Secretary and Sales Manager; Walter Baker, Production Manager; Glen D. Cooper, Assistant Sales Manager; Edgar McNall, Advertising Manager; L. A. Bartlett, Export Manager; B. W. Olin, District Sales Engineer, New England; H. W. Parsons, District Sales Engineer, Pacific Northwest; W. H. Boyd, District Sales Engineer, South; R. L. Coop, District Sales Engineer, Southwest; and A. D. Lane, District Sales Engineer, North.

Stover Mfg. & Engine Co., Freeport, Ill., will exhibit the new Stover completely enclosed horizontal type engine.

Made by the Largest Manufacturers of Wire Rope in the World

Call On Our Nearest Sales Office and Let Our Engineers Assist in Giving You Wire Rope for Safety

American Steel & Wire Company

Subsidiary of United States Steel Corporation

SALES OFFICES: CHICAGO NEW YORK BOSTON CLEVELAND WORCESTER PHILADELPHIA PITTSBURGH BUFFALO DETROIT CINCINNATI BALTIMORE
WILKES-BARRE ST. LOUIS KANSAS CITY MINNEAPOLIS-ST. PAUL OKLAHOMA CITY BIRMINGHAM ATLANTA MEMPHIS DALLAS DENVER SALT LAKE CITY
U. S. STEEL PRODUCTS COMPANY: SAN FRANCISCO, LOS ANGELES, PORTLAND, SEATTLE. Export Representatives: UNITED STATES STEEL PRODUCTS CO., 30 Church St., NEW YORK, N. Y.

Sullivan Machinery Co., 122 South Michigan Ave., Chicago, Ill., will show Sullivan vibrationless portable compressors in several sizes, and air-operated exhibits supplied by a WG-6 7 x 8 compressor of the single-stage horizontal type operated by a short belt drive from a 15-horsepower electric hoist. Drill steel bits and shanks will be forged on a portable drill sharpening machine and other operating exhibits will include demonstrations of Rotator hammer drills, concrete breakers and clay spaders. A portable compressed air hoist will be available with air on the machine to demonstrate its control and an electric driven double drum dragline hoist will be shown. The exhibit at Space WW-15 and WW-45 will be in charge of Ralph T. Stone, assisted by Raymond B. Hosken, General Sales Manager, Chicago, Joseph H. Brown, Chicago District Sales Manager, W. H. Duffill, Detroit, Oscar R. Cundy, Pittsburgh, Chester G. Cummings, Syracuse, and Clement Reeves, D. B. Martin and S. M. Pierce of the Cleveland staff.

Trackson Co., 500 Clinton St., Milwaukee, Wis., will exhibit a new Model LH and Model DH Trackson full crawler for the McCormick-Deering tractor, as well as the Trackson loader, shovel, crane and bulldozer. In attendance at the exhibit in Space WW-44 will be W. H. Stiemke, General Manager, L. E. Dauer, Sales Manager, J. E. Racek, and L. E. Andrews.

The Universal Crane Co., Lorain, Ohio, will exhibit the new Universal-35 mounted on a two-speed center drive crawler and equipped with a ½-yard center drive shovel boom, as well as a 6-ton capacity Universal truck crane mounted on a 4-wheel 5-ton capacity White chassis. One side of the truck mounting will be exhibited as a standard 4-wheel truck and the other side equipped with a motor truck Christie crawler. The exhibit will be at Space AA-4 in charge of A. W. Smythe, Vice-President, and F. A. Peck, Vice-President.

The White Co., Cleveland, Ohio, will show a 6-cylinder light duty chassis with hydraulic four-wheel brakes and truck models adapted to the handling of ready-mixed concrete, as well as the new Model-58 high speed heavy-duty truck in Space WW-109, with Walter C. White, Saunders Jones, L. G. Avery, H. P. Starbird, J. N. Bauman, V. W. Fries, G. R. Bryan, R. W. Knowles, and W. A. Maynard in attendance.

Wood Hydraulic Hoist & Body Co., Detroit, Mich., will exhibit a complete line of working models, scaled to one-third size, including the slab type underbody hoist, the bathtub wet mix body, the G-1 Hi-Speed hoist and M-4 body, the M-2 mechanical hoist and W-12 body, the M-2 mechanical Hi-Lift and W-12 body, the S and T gravity dumpers and the hydraulic repair tower. The booth, WW-105, will be in charge of C. D. Macpherson, General Sales Manager.

The Wood Mechanical Hi-Lift Unit

Zenith-Detroit Corp., Detroit, Mich., will exhibit a full and complete line of heavy-duty carburetors for trucks, busses, road equipment and industrial equipment and a line of fuel filters for gasoline and fuel oil or diesel engine, as well as the new 110 Series Zenith carburetor.

The Good Roads One-Man Autograder

A New One-Man Grader

A NEW one-man grader, to be known as the Autograder, has recently been added to the line of the Good Roads Machinery Co., Kennett Square, Pa. This grader follows general automotive design and construction as far as is practical and is a complete self-powered unit with a Continental motor built into the frame at the rear.

The motor, which is equipped with a self-starter, is mounted on three-point suspension in a heavy box-type steel extension of the main frame members. It is governed at an efficient and economical speed which will insure maximum power. The reduction through the differential and final dual chain drive provides great tractive effort. A high grade automobile type clutch, transmission and differential are used.

The main frame is rigidly assembled with tubular braces, and with the drawbar and circle construction, provides for the heavy duty work for which the power plant is capable. The blade regularly furnished is 7 feet 6 inches long. The blade lifting mechanism is of the cut worm and gear type with counterbalance springs. Machine forged ball and socket joints are designed to insure against blade chatter.

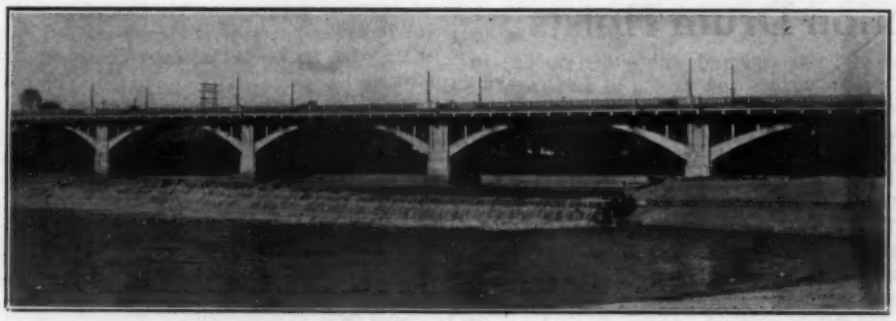
The steering is of the king pin type with cut worm and gear located in the front bolster. The king pin revolves in Timken tapered roller bearings and ready adjustment is provided for wear take-up. The heavy bolster casting ties the frame in front and provides the weight necessary to prevent side slippage of the front wheels. Drum-type heavy rubber tired or steel tired wheels with grousers, Timken equipped, are furnished as required.

Provision for the operator's position is such that he can manage the machine equally well standing or sitting and in either position has a natural, unobstructed view of the roadway and mouldboard.

SEALTIGHT

Means Protection

Meet us at the Road Show in Cleveland Jan. 14-18, 1929. Booth EH-8. Make our booth your headquarters.



SEALTIGHT

PRODUCTS

Expansion Joints
Rail Filler
Protection Planks
Crossing Planks
Bridge Flooring
Industrial Flooring

The best argument for insurance is the maximum protection for a minimum expenditure.

SEALTIGHT products give maximum protection at low rates to both consumer and contractor.

These products are the "go between" that take the abuse. Use SEALTIGHT on your next job for insurance.

Address inquiries on Rail Filler, Protection Planks, Crossing Planks, Bridge Flooring, Industrial Flooring to our agents,

The Universal Asphalt Plank Co.
5 N. LaSalle Street
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W. R. MEADOWS, Inc.
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Make the Job right—use "Sealtight"

Sterling Double Drum Hoist

Friction Drum Hoists

A NEW line of hoists equipped with either gasoline engines or electric motors, and ranging in sizes from 7½ to 50 horsepower, is now being manufactured by the Sterling Machinery Corp., 2303-7 Holmes Street, Kansas City, Mo. These hoists have a number of new features including Timken roller thrust bearings, Johns-Manville asbestos frictions, Alemite-Zerk lubrication and an improved screw thrust.

The Sterling Type A hoist is of the friction drum type. The drum is mounted on bronze bushings so that it may revolve freely on the shaft and is driven by an asbestos-lined cone friction clutch engaged by a screw thrust. Loads are hoisted under the control of this drum clutch and lowering is done with the clutch disengaged so that the drum revolves freely on the shaft and is under the control of the asbestos-lined brake band.

The friction drum clutch is operated by a screw thrust, so designed that it encircles the shaft instead of being placed at the end, and carries a fully enclosed Timken roller thrust bearing which takes the thrust load. The flange which is bolted to the drum and forms the enclosure of the roller bearing extends around a shoulder on the screw thrust so that it is used not only to engage the clutch but also to disengage it. Another advantage of this arrangement is that the drum is entirely free when the clutch is disengaged, there being no spring retaining collars pressing against one drum hub and forcing the other drum hub against a collar. This is valuable in pile driving and other work where a completely free drum is desirable.

The clutch is of the single cone type, fitted with Johns-Manville asbestos lining. It is simple of design and the lining is easily renewed. The asbestos-lined brake band is of the self-energizing type so that only a very slight pressure on the brake pedal is required to bring the load to rest. Two distinct methods are provided to adjust the brake for wear of the lining, which is easily renewed. The brake is counterbalanced to insure positive releasing.

The bearings are lined with high grade Babbitt metal and are split so that adjustment for wear is easily made. Bearing caps are set in recesses in the main frames and the shearing loads are not applied to the bearing bolts.

Type A hoists are so designed that a single drum hoist can be converted into a double drum hoist by merely bolting the second drum frame to the first drum frame. No change in base is required.

The winch head is placed on the drum shaft on the side of the hoist opposite to the operating side. It is 8 inches large diameter, 6 inches small diameter and 7 inches long.

The hoist in the illustration is the Type A double friction drum gasoline engine driven hoist. This hoist is equipped with a Continental Red Seal Model P-35-A, four cylinder gasoline engine power unit with a 4¼-inch bore and a 4½-inch stroke. It develops 35 horsepower at 1,200 r.p.m. and 44 horsepower at 1,600 r.p.m. The unit is complete with an adjustable governor, carburetor, air cleaner, magneto, spark plugs, wires, radiator, fan, gasoline tank and housing. The regular equipment includes a fully enclosed disc clutch on the engine shaft to provide for starting the engine without turning over the hoist gears. The hoist with the engine forms a complete, compact, self-contained unit.

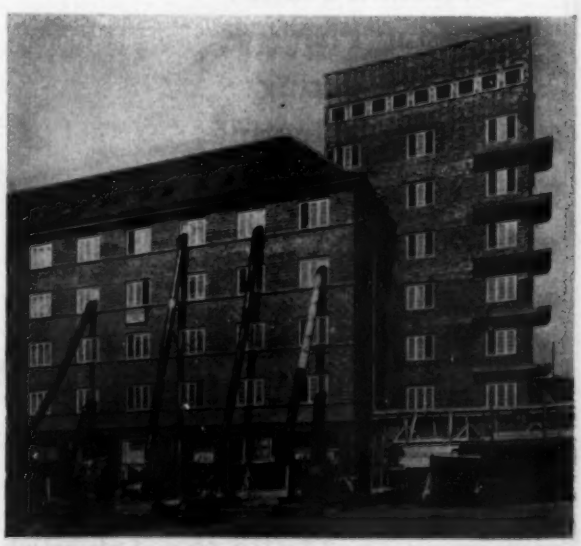
A Super Salamander

AN entirely new technique for drying buildings has been developed in Germany by the Deuba German Building Association, m.b.H., Hannover, Germany, in which the machine for drying the structure is outside of the building instead of inside. Hot air under pressure is forced by means of fans from the air heater through flues about 18 inches in diameter into the building which is completely shut off from the outside air. This hot air spreads into the different rooms and because of the pressure produced by the fans, the dry hot air reaches all points and thoroughly dries out the structure.

Analyses of the gases in three rooms, one, the entrance room, two, the middle room and, three, the room from which the air escapes show a constantly decreasing amount of carbon dioxide, which is forming calcium carbonate in the plaster in the structure. The hydrate of lime takes the carbon dioxide from the air, changes it to calcium carbonate and frees water, which, as a result of the hot air changes into water vapor and escapes through the masonry. The excess water in the plaster evaporates according to the temperature of the air.

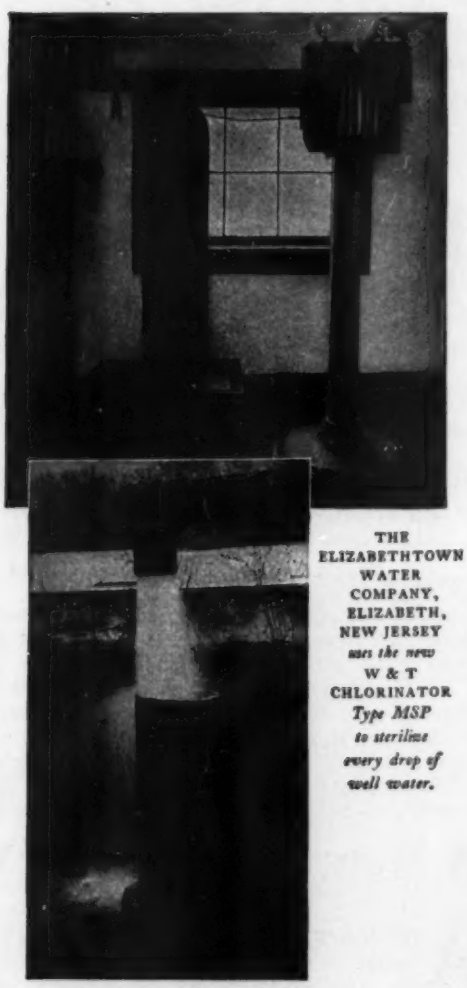
The machine which produces these results gives a greater hardness of plaster after four days than the naturally dried plaster has after two years and consists solely of a fire grate which burns between 60 and 80 pounds of coke an hour through which air is driven by a blowing engine operated by an electric or gasoline motor. The temperature of the air blast can be maintained between 30 and 100 degrees by regulating devices on the machine. It is possible to dry out any building in from 3 to 4 days with a battery of these machines.

The sale of these machines in the United States is to be handled by The Duraflex Co., 11 Beacon Street, Boston, Mass. In a few weeks one of the machines will be available for demonstration.



New German Method of Drying Out Plaster and Masonry Used at the Hochhaus, Stephansplatz, Hannover

All Well Waters —Should Be Chlorinated!



THE ELIZABETHTOWN WATER COMPANY, ELIZABETH, NEW JERSEY *uses the new* W & T CHLORINATOR *Type MSP to sterilize every drop of well water.*

PUBLIC HEALTH ENGINEERS are rapidly dissipating the old-fashioned but popular idea that well waters are pure and safe to drink just because they are well waters and come from under-ground sources.

They know that well waters are liable to pollution—that a fissure in the rock or a break in the well casing often permits disease ladened contamination to enter the supposedly pure water—particularly in times of flood.

They know that hundreds of Typhoid Fever Epidemics have been caused by well waters.—They know that the three outstanding typhoid epidemics in recent history—Salem, Ohio—Lansing, Michigan—Santa Anna, California—were all caused by polluted, *unchlorinated* well water.

That is why there is a marked tendency toward the chlorination of all well waters—because a properly chlorinated water cannot cause disease—because chlorination will not change the physical or chemical characteristics of the water in any way—because chlorination costing but one cent per capita per year is the cheapest public health insurance.

"The Only Safe Water is a Sterilized Water"

WALLACE & TIERNAN

COMPANY, INCORPORATED

Manufacturers of Chlorine Control Apparatus

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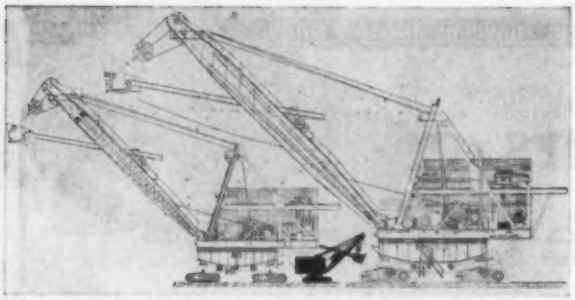


Comparative Sizes of Marion 15, 12 and 1¼-Yard Power Shovels

A 1¼-Yard Diesel-Powered Shovel

IN addition to its spectacular 12-cubic yard and 15-cubic yard electric motor-driven shovels, the Marion Steam Shovel Co., Marion, Ohio, has presented during the past season a 2-cubic yard and 1¼-cubic yard diesel-powered shovel looking toward fuel economy. These shovels are diesel-powered but electric driven. An interesting comparison of the 12- and 15-yard machines with the 1¼-yard machine is shown above.

The 2-cubic yard diesel electric uses a Winton, 6-cylinder, 4-cycle, airless injection engine, developing 150 horsepower at 750 r.p.m. It has a 7-bearing, 4¼-inch diameter crankshaft and is direct-connected to a 50-kilowatt continuous "dropping voltage" generator which supplies the current to the 3 mill-type roller-bearing, fan-ventilated, mica-insulated, direct current motors which are necessary to flexibility of function and convenience of operation. The diesel used in the 1¼-yard diesel electric unit is a Buda M.A.N. 4-cylinder, 4-cycle, airless injection engine developing 92 horsepower at 1,000 r.p.m. It has a 5-bearing crankshaft and is direct-connected to a 25-kilowatt "dropping voltage" generator. The motors are mill type and of the same construction as those on the 2-yard unit.

The Marion Steam Shovel Co., is now assembling the first 15-yard stripping shovel known as the Marion Type 5600. Where the 12-yard unit Type 5480 has a 90-foot boom, 60-foot handle and 12-yard bucket, the Type 5600 has a 120 foot boom, 83-foot handle and 15-yard bucket. The Type 5480 weighs 850 tons and the Type 5600 weighs 1550 tons.

The Marion 1¼-Yard Diesel Electric Power Shovel

Helmet Goggles for Welders

AMONG the accessories for welding and cutting recently added to the line of the Oxweld Acetylene Co., 30 East 42nd Street, New York, are the Oxweld cap and skeleton type helmet goggles.

The No. 9 cap type goggles consist of a strong fibre cap, to which a pair of goggles are attached by means of fibre links. The goggles can be readily raised over the forehead or lowered over the eyes with one hand. The bridge is adjustable and is covered with rubber insulation. Replaceable lenses, in the same size and colors as are supplied with the Oxweld No. 6 goggles, are used, the colored lenses being protected by cover lenses of clear glass.

Oxweld Skeleton Type Helmet Goggles

The No. 10 skeleton type goggles, which are shown in the illustration, are the same except that the goggles are attached to a lattice skeleton cap. Both styles are provided with leather straps at the rear for proper adjustment to the head-size.

These cap and skeleton type goggles are very durable and furnish considerable protection to welders who use them.

A New Hoist for Use With Tractor

A COMPACT, self-contained single drum hoist which attaches to the rear of the Caterpillar 2-ton tractor is manufactured by the Willamette Iron & Steel Works, Portland, Ore. This new hoist, which has a total weight of 400 pounds, has electric steel side frames and a semi-steel drum. All bearings are bronze bushed and the pinions double heat-treated. It has a brake which the manufacturers guarantee to hold any load within the capacity of the hoist, and an adjustable, asbestos-lined, cone type friction clutch. Both the brake and the ratchet are operated from the driver's seat. It has a Caterpillar standard stationary drive.

The barrel of the drum is 5 inches in diameter, the flanges 12½ inches in diameter and its length 12½ inches. The total overhang from the back of the transmission case is 21½ inches, which distributes the hoist weight evenly. An outboard gypsy for snubbing purposes is included as standard equipment.

The cable capacities of these hoists are 600 feet of ¾-inch line or 400 feet of 7/16-inch line. The line speeds, figured at 1,000 r.p.m. of the tractor motor, are 135 feet per minute

The Story of ACCURACY in Neptune-built Meters

CHAPTER 7 OF A SERIES

Gears and Pinions gauged, gauged, gauged!

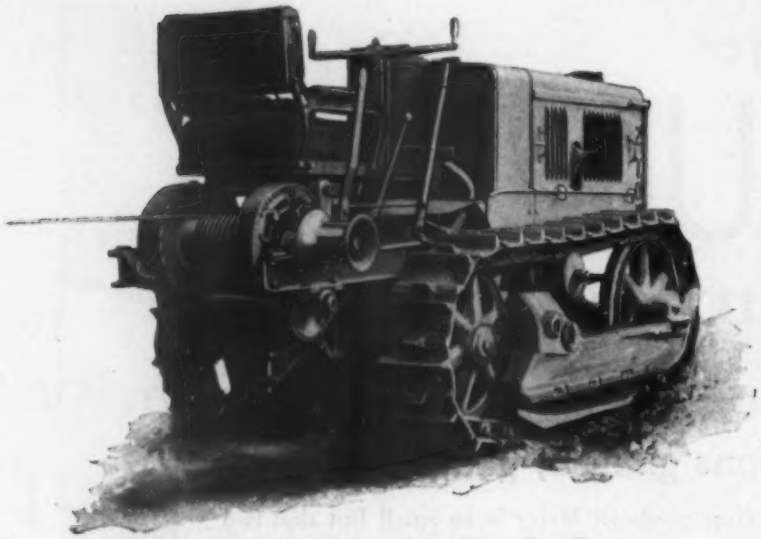
No gear or pinion in a Neptune-built Meter is so small but that two or more gauges are used to double check its accuracy. Even the little renewable and heat-proof rubber bushings are checked by five separate gauges! Is it any wonder these gear trains *hold* their remarkable accuracy over years of continuous operation?

Of Trident and Lambert Meters ("The Cash Registers of the Water Works Field") over 4,500,000 made and sold the world over.

NEPTUNE METER COMPANY

THOMSON METER CORP., 50 East 42nd Street, NEW YORK CITY, N. Y.

Pioneers in Meter Progress Yesterday—TODAY—Tomorrow



Willamette Hoist Attached to Caterpillar 2-Ton Tractor

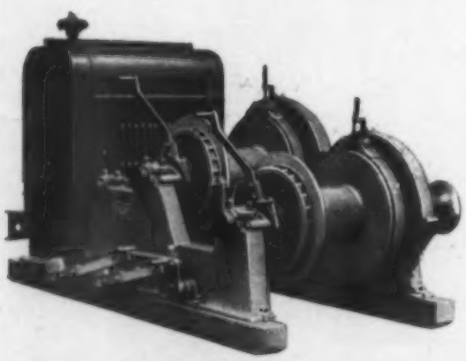
bare drum, 344 feet per minute full drum and 240 feet per minute average. The line pull is 3,500 pounds bare drum, and 1,600 pounds full drum.

This hoist mounted on a Caterpillar 2-ton tractor is adapted for stringing power lines, tightening guy lines, steel erecting, tearing down concrete forms, loading logs or timber, wrecking buildings and lifting timber and beams in all types of construction work.

New Line of Hoists

THE first of a series of hoists has been announced by the S. Flory Manufacturing Co., Bangor, Pa. This new hoist, the Flor-Ox, is designed to give efficient service with less weight and space.

It is built with either a 35-horsepower electric or gasoline motor. Its main gears and pinions have machine cut teeth. It has a silent chain drive enclosed in a dust proof casing. The clutch operating mechanism is provided with a roller



The New Flory Hoist Having Less Weight and Occupying Less Space

bearing thrust and the friction lever is equipped with a positive release device, insuring a free drum at the first motion of the lever.

The Flor-Ox 35 has a capacity of 5,000 pounds at 165 feet per minute.

The hoist can be altered, in the field, from a single to a double or triple drum by bolting on the units desired. If desired, a boom swinging attachment can be furnished.

A Heavy Duty Radiator for Gas Engines

A RADIATOR made with a special heavy duty core, the tubes or water passages being extra large, to pass not only water but dirty material in the system and thus permit filling the radiator from a brook, stream or any other water available, has been developed by the Young Radiator Co., Racine, Wis., for extra large gas engines. The use of muddy water is oftentimes necessary in the field. The tubes which are of the oval type, lock seamed and soldered both inside and out, are guaranteed by the manufacturer not to burst from freezing. This feature is important in cold weather for construction goes on summer and winter, and the job cannot be stopped just because the radiator might freeze and breakage occur during days and nights of the zero weather.

The core sections are removable by merely loosening two bolts at the top and two bolts at the bottom, so that if the cores are damaged or breakage should occur, the power unit does not have to be stopped, but merely the holes plugged up at the top of the tank where the section to be removed is joined and work can be continued until replacement is made. This feature alone is valuable, as anyone having driven an automobile with a punctured radiator will agree.

The side members are of heavy channel rolled section, giving great strength to the unit and making it free from vibrations, thus minimizing possible breakage from this source. The manufacturer states that the units are built to stand the most severe service in the field and to give long and lasting service and to require practically no attention except to be cleaned once every six months and every piece of construction equipment should be overhauled at least twice yearly.

The New Young Radiator for Engines of 200 to 300 Horsepower

Standard Macadam Asphalt Binder "B" on Long Pond Road,
Town of Greece, Monroe County—1925

Standard Asphalt Products

Standard Asphalt Binder A
for surface treatment

Standard Asphalt Binder B
for penetration work

Standard Asphalt Binder C
for the mixing method

Standard Asphalt Joint Fillers
for brick or block pavements

Standard Cold Patch Asphalt
for repairing all types of bituminous road surfaces

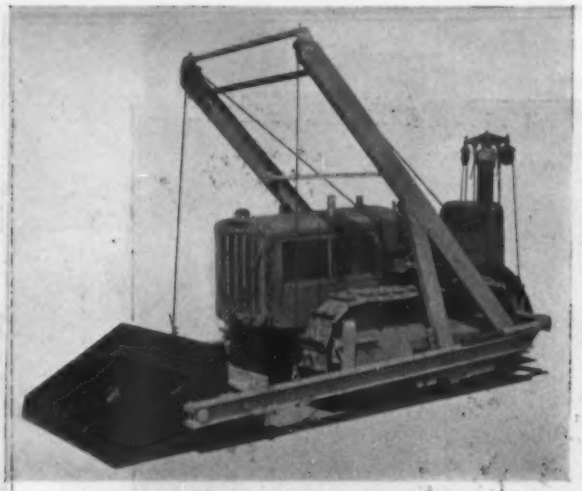
Standard Refined Asphalt
(Socony Brand)
for sheet asphalt paving

Standard Paving Flux,
Bridge Asphalt and
Preserving Oils

Specifications and all other particulars furnished on request

SOCONY
ASPHALTS AND ROAD OILS

STANDARD OIL COMPANY OF NEW YORK, 26 BROADWAY



Blair Hydraulic Digger

An Effective Dirt-Mover

A HYDRAULIC digger, especially designed for lengthy and heavy duty service, is manufactured by the W. M. Blair Manufacturing Co., 3673 Michigan Avenue, Chicago, Ill. This digger which is powered by a Caterpillar Twenty adapts itself to many uses in the construction field.

The bucket is made of ¼-inch steel electrically welded and riveted. It is 60 inches wide and has a capacity of 3 to 5 yards. A high carbon steel cutting edge is riveted to the bucket so that it can be replaced. The frame work is welded and riveted to make a strong solid unit.

From a rotary gear pump driven direct from the power take-off, oil pressure is exerted on a hydraulic cylinder which lifts the load. There are no brakes or clutches or complex operating mechanism. The bucket is raised, lowered or held in any position by means of the pump control lever mounted within convenient reach of the operator, and can be dumped at any height. The cylinder is made of Shelby seamless steel tubing 6 inches outside diameter with ¼-inch walls, honed on the inside to insure the piston's moving without leakage. The piston is of cast iron and has two piston rings. The piston rod is also made of Shelby seamless steel tubing 2⅜ inches outside diameter.

The pump which is mounted on the end of the rear power take-off of the Caterpillar Twenty and can be engaged or disengaged by means of the power take-off shift lever, is of the standard rotary gear type using hardened ground steel gears, accurately machined and fitted.

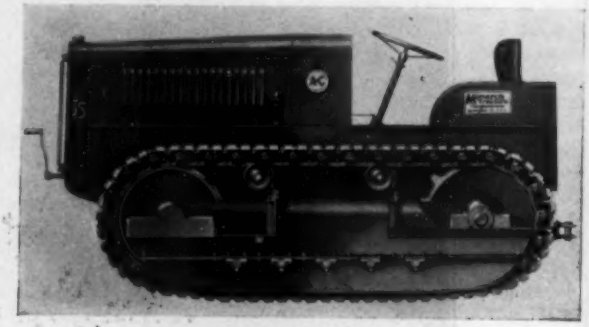
The booms are made of 5-inch H-beams strongly braced and trussed. The high lift model shown in the illustration has a dumping clearance of about 7 feet and weighs about 2,500 pounds.

New Models of Tractors

THE Monarch Tractors Corp., Springfield, Ill., has recently announced new models of its tractors. The new Monarch 35, a track type tractor which is shown in the illustration, offers a maximum of 36 drawbar horsepower, three speeds forward and one reverse, 1.84, 2.75, 4.00 and 2.12, respectively. The engine is a standard Allis-Chalmers type, designed and used exclusively for tractor work, and has four cylinders with removable sleeves set in the block, a 4¾-inch bore and 6½-inch stroke. The motor speed under a full load is 930 r. p. m., and is under governor control. The length over all, including starting crank, is 10 feet 4 inches, the width over all 5 feet 2 inches, and the height to the top of the radiator 5 feet 1½ inches.

The track is of extra length as in the largest models, the 50 and 75, providing maximum traction ability and an even distribution of weight. Steering is done with a steering wheel and steering clutches, which enable the tractor to turn virtually in its own length.

Its standard equipment includes tools, radiator guard, hood over the engine and under pan. Top, curtains, winter cap,



The New Model 35 Monarch Tractor

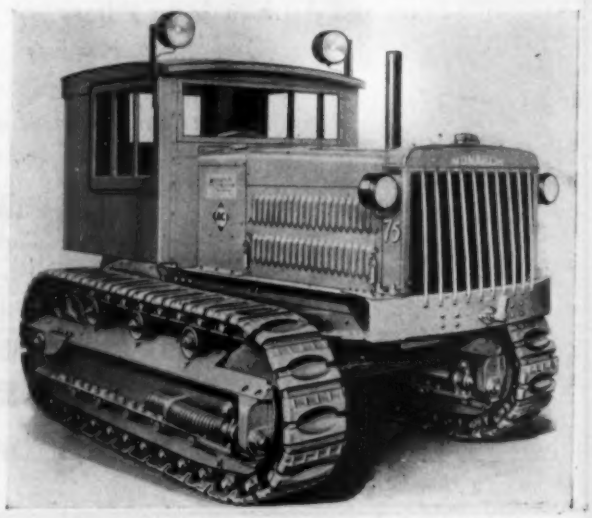
power pulley attachment, special dirt, snow and ice grousers and street plates may be secured as extra equipment if desired.

The other additions to the regular Monarch line are the equipment for the 50 and 75, which converts them into models for winter work. Both these models have recently been equipped with a fully enclosed weatherproof cab so constructed as to be roomy and comfortable and at the same time offer protection from the weather under the most inclement conditions. Full vision glass panes on all four sides offer maximum visibility. This makes it possible to continue construction work requiring the use of tractors during the winter with no loss of operating efficiency.

For the problem of snow fighting and removal, these tractors have special easily detachable and self-cleaning ice and snow grousers. Tracks with the grousers cast integral can also be secured.

Both these models have great reserve power, making them adaptable to snow removal work, and they are so designed that any one of the various makes of heavy V-type or rotary plows are easily attached. The tractor is run in between the frames of the plow and attached to the drawbar pin.

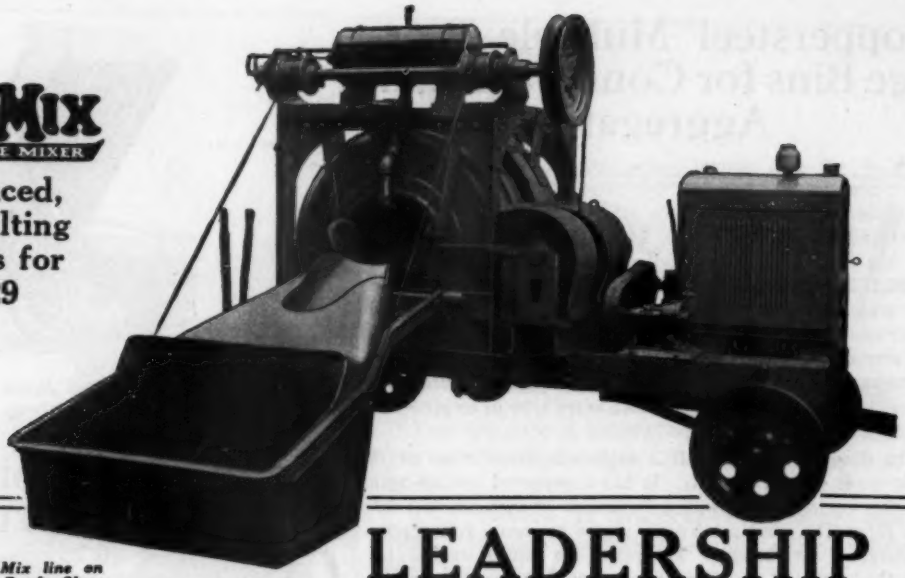
An electric starter provides easy starting in the coldest weather, and complete lighting equipment is furnished for night work or service in blizzards.



Allis-Chalmers Monarch Tractor for Winter Work

KWIK-MIX
CONCRETE MIXER

Advanced, Non-Tilting Models for 1929



LEADERSHIP

See the complete Kwik-Mix line on exhibition at the Good Roads Show in Cleveland, Ohio, Jan. 14th to 18th.

DISTRIBUTORS

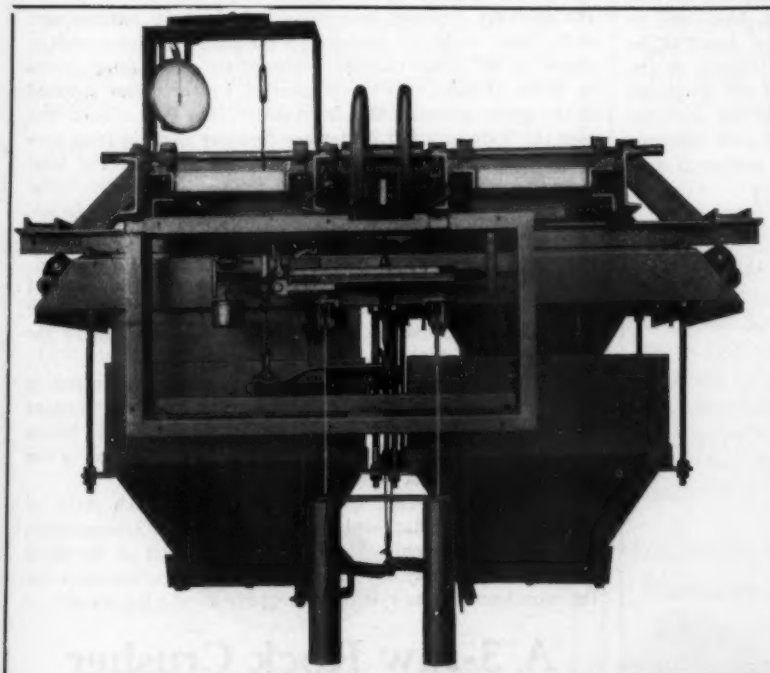
We have good open territory on our complete line of tilting and non-tilting mixers. If interested in a live line of tilting and non-tilting concrete, mortar and plaster mixers, write at once for low prices and liberal discounts.

The greatest Kwik-Mix line ever put on the market is now being enthusiastically received by the concrete industry.

These models incorporate many new time- and labor-saving features with better mixing principles, high-grade roller-bearing drive with heavy-duty, hot-riveted and electric-welded steel drum and frame construction.

Write at once for complete description of all the latest improvements found in the new Kwik-Mix Non-Tilting line.

KWIK-MIX CONCRETE MIXER COMPANY
Department 130, Port Washington, Wis.



NEW Volume-Weighing ERIE AggreMeter

COMPLETE UNIT—
The New Erie Volume-Weighing AggreMeter is shipped complete so that no assembly is necessary in the field.

EASILY ATTACHED TO ANY BIN—
It is arranged for platform operation and can be attached to any bin.

CAPACITIES—
5000 lbs. by weight.
By Volume—
Sand 9 to 19¼ cu. ft.
Stone 10.2 to 29 cu. ft.

ONE OPERATOR—
All operating members are directly in front and in full view of the operator.

SUCCESSFUL OPERATION GUARANTEED—
These plants have been in operation for sometime and their design, accuracy and easy operation have been highly commended on by the users.

ERIE STEEL CONSTRUCTION COMPANY, ERIE, PENNA.

Please Send Photographs and Literature on the New Erie Volume-Weighing AggreMeter

Name .....
Company .....
Street Address .....
City ..... State .....

See this AggreMeter at the Road Show

Coppersteel Multiple Storage Bins for Concrete Road Aggregates

FOR the past several years wooden storage bins have been rapidly replaced by metal bins which are more durable and resistant to atmospheric conditions. The Beaumont Manufacturing Co., 330 Arch Street, Philadelphia, Pa., has developed a new and unique model of storage bin which is made entirely of rust resisting coppersteel. These bins made of copper bearing steel plates with rigid and bolted construction throughout will withstand the operating conditions, the corrosion caused by wet materials and even atmospheric corrosion indefinitely. They are built in standard sizes and are easily portable, a condition which every type of construction unit must fulfill.

The Beaumont Single-15 is a single compartment bin of 15 cubic yards heaped capacity. It has a hoppered bottom with one gate opening fitted with a Beaumont 16-inch all steel duplex gate. The sides are steeply sloped to insure full gravity discharge of the material. The plates are copper steel, 3/16-inch thick and all connections are bolted, a feature making for easy and rapid erection or dismantling. The columns are 6 x 6 x ⅜-inch angles and are adjustable on the bin so that the truck clearance can be varied 16 inches. A concrete foundation is recommended if the location of the bin is permanent, but heavy timbers or planks are sufficient for temporary locations. The bracing is 3 x 3 x 5/16-inch angles. The height is 15 feet 9 inches to 17 feet 1 inch, having a 16-inch adjustment, the outside width 10 feet 10 inches, the length 10 feet 10 inches and weight complete with the gate, 5,100 pounds.

These single compartment bins are made in capacities of 15, 27, 42, 75 and 110 yards. For a multiple compartment bin, there is the Beaumont Addabin. The Addabin, built only in the larger sizes, is made so that any number of bins can be placed in a row and added to as desired. The columns of the Addabin are so designed that an additional bin can be placed alongside the existing bin simply by adding the bin unit and one set of columns, all columns being designed with sufficient strength to take care of the addition of the next section of storage bin.

The New Beaumont Coppersteel Road Bin

The New Heil Junior Hoist for Light Duty Dump Trucks

Dump Body Hoist for Light Duty Trucks

OPERATORS of light duty trucks up to 1½-ton capacity have felt a definite need for a dump body hoist designed and constructed to provide ample lifting capacity without materially adding to the excessive dead weight. To meet this specific purpose, the Heil No. 1 junior hoist has been designed and put on the market by the Heil Co., Milwaukee, Wis.

The Heil junior hoist is a sturdy unit, following the construction principles used in the Heil heavy-duty hoists. The complete unit consists of the single cylinder hydraulic hoist, the hoist supporting frame, the power take-off, wood sills, connecting parts and a body which may be selected from three standard Heil L-type bodies.

A single cylinder with a 5¾-inch bore encases the piston. The specially designed gear pump, which is an integral part of the hoist, builds up pressure by pumping oil from a reserve supply to the piston chamber. Immediately the piston moves up in the cylinder at a speed governed by the power supplied to the pump gears by the drive shaft. The No. 1 hoist will raise the body to a full 55 degrees dumping angle in from 5 to 10 seconds, depending on the speed of the motor. The hoist controls are conveniently placed in the truck cab. One lever engages the power take-off and the other operates the hoist by-pass lever, which controls the return of the body to riding position.

The piston cross head shaft is firmly bolted to the body of the sub-frame, and with the hoist free to rotate in its saddle trunions, the push of the piston is always directly against the load during the dumping operation.

The hoist is mounted in a supporting frame reinforced to withstand the downward thrust of the load. The frame fastens to the chassis frame with U-bolts and frame clips. The hinges which bolt to the sub-frame of the body are attached to the rear end of the hoist supporting frame.

Heil power take-offs, specially designed for each make of truck, are finely machined to fit any style of transmission. The drive shaft, running from the power take-off to the pump gears, is equipped with a sliding sleeve which compensates for the movement of the cylinder during the raising movement.

A 3-Jaw Rock Crusher

A NEW jaw crusher which combines three crushers in one is manufactured by the Bakstad Crusher & Equipment Corp., 122 South Michigan Avenue, Chicago, Ill. This jaw crusher reduces in one operation any class of material ordinarily fed to crushers, sizes up to 12 inches in the smallest dimension, to a product passing a ½-inch screen. It can be adjusted also to produce any desired intermediate size up to 2½- or 3-inch product.

JOHNSTON BOILERS IN GREECE

For sixty years Johnston Brothers have been building boilers to help speed the world's work. The Johnston organization is composed of men who know boilers like Luther Burbank knew plants.

The factory is modernly equipped, the workmen are trained to standardized operations and we have our own system of rigid shop inspection supplemented by a resident insurance company inspector. You can bring your boiler problems to the Johnston Brothers organization confident that you will secure expert services, unsurpassed in the boiler-making industry.

DEMAND THIS TRADE MARK

JOHNSTON BROTHERS, Inc.

Specializing in Boilers for Contractors Equipment

Ferrysburg, Michigan

3-C COLUMBIA CALCIUM CHLORIDE 77-80% TRADE MARK

Profitable!

In Concrete Road Building

You are sure of satisfactory results every time you use "3-C" Calcium Chloride for curing concrete.

This method is practical—economical—efficient. It improves strength and quality—saves time and money.

Tests conducted by many authorities, and actual results in the field, are convincingly in favor of Calcium Chloride for curing concrete.

Cold Weather Construction

The "3-C" method permits opening a new concrete road in 7 days—a saving of 14 days over old methods.

"3-C" Calcium Chloride is an effective aid in cold-weather construction. It hastens the "set" and consequently shortens the time when protection must be maintained. It assures work of better quality.

Take Advantage of Our Technical Service

Experts in our technical department are able to give you the advantage of much valuable data and information on concrete curing, road building and road maintenance. Please feel free to call on us for this service.

By all means let us send you literature explaining the use of "3-C" Calcium Chloride. Use the handy coupon.

COLUMBIA CHEMICAL DIV.
Pittsburgh Plate Glass Co.
BARBERTON, OHIO.

Columbia Chemical Division,
Pittsburgh Plate Glass Co., Barberton, Ohio
Please send complete information on the use of "3-C" Calcium Chloride for Curing Concrete.

Name .....

Street .....

City .....

CEM-129

The primary jaw of the crusher reduces the large rock to a size receivable by the two secondary crushing paths directly below, the product from the upper jaw being divided evenly by the separator above the intermediate swing jaw. The movement of the primary jaw is transmitted to the intermediate jaw by the connecting link, causing the secondary crushing units to open and close in unison with the primary jaw. While the combined travel of the secondary jaws is slightly greater than that of the primary jaw, the effective jaw movement for each secondary crushing path is only a little more than one-half of that of the primary jaw. This is important because of the necessity for a shorter jaw movement in the secondary crushing paths, where final reduction takes place.

To vary the size of the product desired, it is only necessary to change to another size of the adjustment toggle which transmits power to the moving jaws. Such adjustment affects all three jaws proportionately, but always leaves the secondary openings equally spaced. With the stationary jaw of the primary crusher also adjustable by changing to another length of safety toggle behind it, the relation between primary and secondary paths is equalized for different adjustments and provides for variations in friability of mineral aggregates.

The Bakstad Three-Jaw Crusher with Bucket Elevator

The actuating mechanism is of the lever type, transmitting the crusher movements to the jaws by the action of the eccentric shaft against the roll supported in the lever.

The main frame and all other principal parts of the crusher are of open-hearth cast steel, accurately machined. All bearings are dust proof and provided with high-pressure lubricators throughout, reversible for wear and quickly removable. The crushing plates are of manganese steel, also reversible for wear and interchangeable from stationary to moving jaw in both the primary and secondary paths. The adjusting toggles, wedge bolts and so forth are readily accessible, and the secondary jaw opening are reached through suitable portholes in the side frame.

An Improved Crane

A NUMBER of new improvements in the Manitowoc-Moore Speedcrane has been announced by the Manitowoc Engineering Works, Manitowoc, Wis., the unit cast-steel crawler base construction being of particular interest. A single, high-manganese steel casting carries all of the axles, adjusting screws, center pin and roller path gear, and

One of the New Speedcranes in Action

houses the travel shafts, gears and clutches. The base casting is of heavy and deep section throughout, and designed to give the utmost rigidity and strength. The roller path gear is heavily doweled and riveted to the car body.

The power of the crane has also been increased. The standard Speedcrane engine is the Hecules model TXO. It develops 92 horsepower at its full load operating speed of 900 r. p. m. By means of a conveniently placed accelerator pedal at the operators position which is connected to the governor, the engine speed can be raised to 1,200 r. p. m. and the horsepower developed to 108. This accelerator device materially speeds up operations.

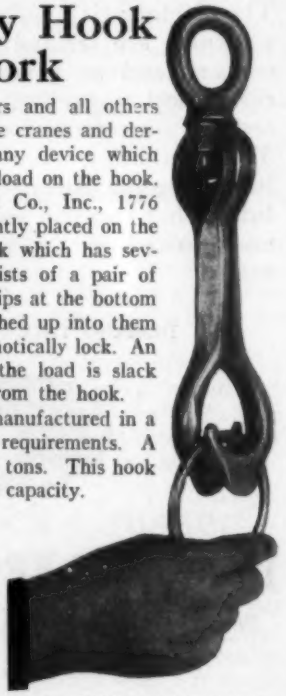
Power transmission is through a Twin Disc clutch, fully housed and run in Timken roller bearings. All the drive gears and clutches and boom hoist worm gear are enclosed, running in oil. A diesel engine or any other special engine may be installed, as there is a large amount of free floor space at the rear end of the cab.

A New Safety Hook for Crane Work

STEEL erection contractors and all others who have occasion to use cranes and derricks are interested in any device which will increase the safety of the load on the hook. The Public Works Equipment Co., Inc., 1776 Broadway, New York, has recently placed on the market the Bulldog safety hook which has several notable features. It consists of a pair of hooks so arranged with flaring lips at the bottom that a chain or cable, when pushed up into them opens the hooks and they automotically lock. An easy twist of the cable when the load is slack completely releases the cable from the hook.

The Bulldog safety hook is manufactured in a wide range of sizes for all load requirements. A 12-inch hook has a capacity of 4 tons. This hook is smaller than any other of like capacity.

The accompanying illustration demonstrates the ease with which a cable ring or chain is pushed up into the protruding lips of the safety hook and shows the position just before the two hooks come together to form a safe hold on the load.



The Bulldog Safety Hook

The PARSONS 31

is now ready for your jobs

Model 31

Digs in the center or at either side

NEW to the market, but it's already been through the mill—first on hard testing under factory supervision—then out on regular jobs. Down in Kansas a contractor picked the Parsons 31 to finish a natural gas line that was delayed. Though crowded to top speed most of the time, the 31 had no trouble eating its way through gumbo, gravel, hard pan and shale-rock. Operators on this work say, "The 31 sure has the guts. It dug rings around a bigger machine in the same stuff."

Speed? Better than 14 feet a minute. Width? Digs as narrow as 18 inches, and yet can tackle a trench 48 inches wide and 12 feet deep.

The 31 has many new features that mean greater capacity and lower trench cost. For example, all main gears are enclosed, running in an oil-tight case with shafting mounted on Timken bearings.

The 31 is a great big brother to the Parsons 21, the first machine to dig at either side or in the center, and now in its fifth year of successful operation.

The 31 also digs with boom offset, so that it handles close-quarter jobs where other big machines would be helpless.

Write for details and specifications

SEE OUR EXHIBIT AT THE CLEVELAND ROAD SHOW—BOOTH WW-30

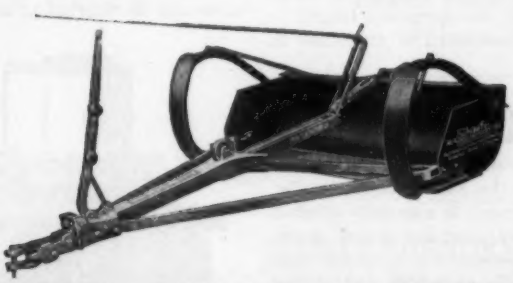
THE PARSONS COMPANY **Newton, Iowa**

LOADING

Schaefer CLEVELAND

One-Man Tractor Scraper

DUMPING



ON EXHIBIT AT THE ROAD SHOW

The Schaefer One-Man Tractor Scraper. A successful earth-moving tool, furnished with or without Auxiliary Back-up Control. Easy to operate—Simple—Safe—Strong.

If you can't see it for yourself at the Road Show, write for our circular.

The Gustav Schaefer Wagon Co.

4180 LORAIN AVENUE CLEVELAND, OHIO

A Four-Boom Excavator

A NEW excavator for use in road digging, grading, cutting, filling and general excavation and construction work has been announced by the Barber-Greene Co., 485 West Park Avenue, Aurora, Ill. A novel feature of this machine is that as it excavates, it prepares the material for other uses. Instead of discharging the material in huge lumps or chunks, it has a constant milling action, like that of the Barber-Greene ditcher, and thus sends the material off the end of the discharge conveyor in a ground up form, suitable for all kinds of filling.

The machine has a sturdy chassis, mounted on crawlers with four Barber-Greene vertical booms going ahead of the chassis. It is designed to do unusually tough digging and also accurate grading. It makes a cut 1 inch or 7 feet deep and 8 feet 5 inches wide. The booms are in two units of two bucket lines. Each unit is controlled independently of the other.

Delivery End of the New Barber-Greene Excavator

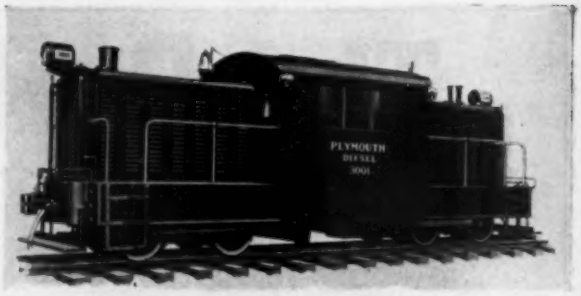
Another feature is that this machine is a constantly digging device, the whole boom mechanism being raised and lowered by power. There is in front of the operator a set of indicators showing the angle of the boom and the machine in both the horizontal and vertical plane. The dials also show the depth of the cut and the relation of the two boom units to each other. This makes it possible for the operator to watch the grade, and to control easily the digging angle and depth of the cut. In this way the efficiency of the machine is maintained and is in no way cut down by the operator's fatigue.

The capacity of the machine is estimated at from one to three yards per minute.

60-Ton Diesel Locomotive

A NEW 60-ton direct gear drive diesel locomotive has recently been brought out by the Fate-Root-Heath Co., Plymouth, Ohio. This locomotive is especially adapted to general industrial haulage, quarries, sand and gravel plants, construction work and short line railroads. It is 37 feet long over the coupler knuckles, 11 feet 8 inches high and 10 feet wide.

It is equipped with a Winton diesel engine M-141 with 8 cylinders, 8½-inch bore, 12-inch stroke and airless injection, developing 400 horsepower at 700 r.p.m. If desired it can also be equipped with two 200-horsepower gasoline engines. The transmission is of heavy construction with four speeds forward and reverse and uses a jaw type clutch. The shafts are of nickle chromium steel, heat treated and carried on Timken, Hyatt and New Departure ball bearings. The jaw clutches are shifted by air cylinders. The gears are of alloy steel, cut teeth and heat treated and range in size from 11¼ inch diameter, 5-inch face to 34-inch diameter, 8-inch face.



The New Model XL, 60-Ton Plymouth Diesel Locomotive

The locomotive is built with either standard or special speeds, the standard speeds being 3, 6, 12 and 23 m.p.h. and the special speeds, 4½, 9, 18 and 36 m.p.h. The tractive force of the standard speeds at low gear is 37,188 pounds and of special speeds at low gear, 24,792 pounds.

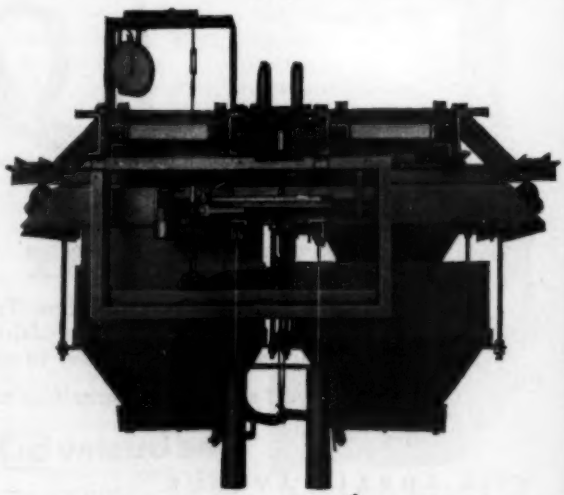
Equipment for the locomotive includes Westinghouse No. 14 E L double end control locomotive brake equipment, two air compressors, electric lights, bell with internal quick action bell ringer, chime whistle or Westinghouse Pneuphonic horn, automatic couplers and all safety devices to comply with I. C. C. requirements.

A New Volume-Weighing Batcher

A NEW volume weighing AggreMeter which can be attached to practically any type of bin and which comes complete so that no assembly is necessary in the field has recently been placed on the market by the Erie Steel Construction Co., Erie, Pa.

This AggreMeter can be used for measuring by weight or volume, one after another and has ample capacities for any demand. The capacities of the boxes by volume are 9 to 10¼ cubic feet for sand and 10.2 to 29 cubic feet for stone. The beam scale is of 5,000 pound capacity.

All operating members of the AggreMeter are conveniently placed in full view of the operator. The draw-off doors are automatic-closing when the material is dumped and can be dumped together or separately. The rack and pinion operated gates work easily and smoothly and a batch of sand and stone can be weighed or measured and dumped in 30 seconds.



The New Erie Volume-Weighing AggreMeter

Help for your pumping problems!

If you have trouble pumping asphalt or other viscous materials that will not flow at atmospheric temperatures, we can be of service to you. Every requirement is adequately met through the use of Iroquois Steam-Jacketed Pipe, Fittings and Pumps.

They embody the experience of a quarter-century and are specially adapted for use in asphalt, oil and coal-tar refineries, and for plants manufacturing prepared roofing, gas, chemicals, starch, glucose, molasses, fatty acids, etc.

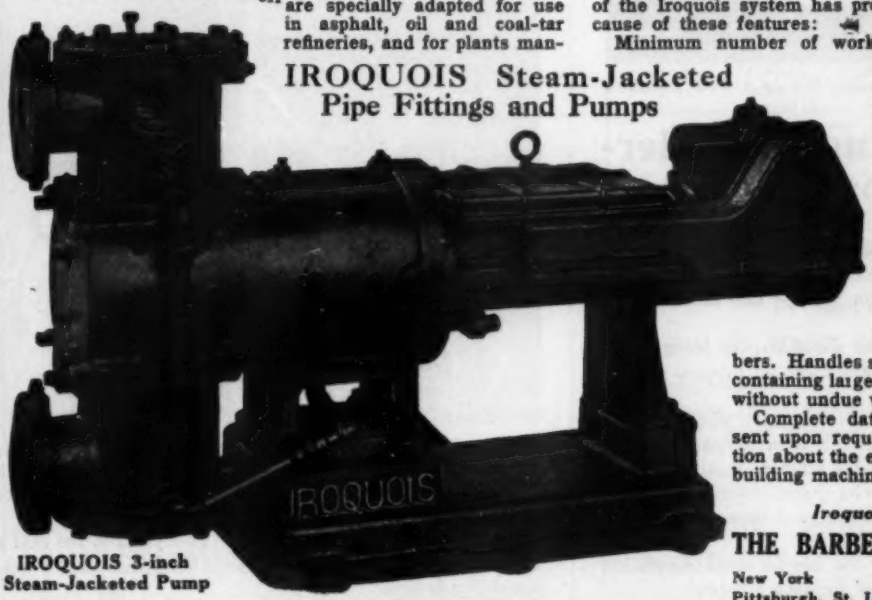
Iroquois Steam-Jacketed Pipes have one pipe inside of another, the inner one being surrounded by steam, keeping hot the material which is to be pumped.

The Iroquois Steam-Jacketed Pump which is also a part of the Iroquois system has proved so highly efficient because of these features:

Minimum number of working parts in contact with material being pumped. Large wearing surfaces to reduce wear. Large, straight passages for liquid being pumped. Simplicity of construction insures low maintenance cost. Ease of operation with no skilled attention. Steam jackets cover all moving parts—pump can be started and stopped at will without cleaning it. Perfect accessibility of all wearing parts. No springs or small, easily broken parts in valve chambers. Handles successfully viscous material containing large quantities of foreign matter without undue wear or operating troubles.

Complete data and specifications gladly sent upon request, together with information about the entire Iroquois Line of road-building machinery. Write us today.

IROQUOIS Steam-Jacketed
Pipe Fittings and Pumps



IROQUOIS 3-inch
Steam-Jacketed Pump

Iroquois Sales Department

THE BARBER ASPHALT COMPANY

New York Philadelphia Chicago
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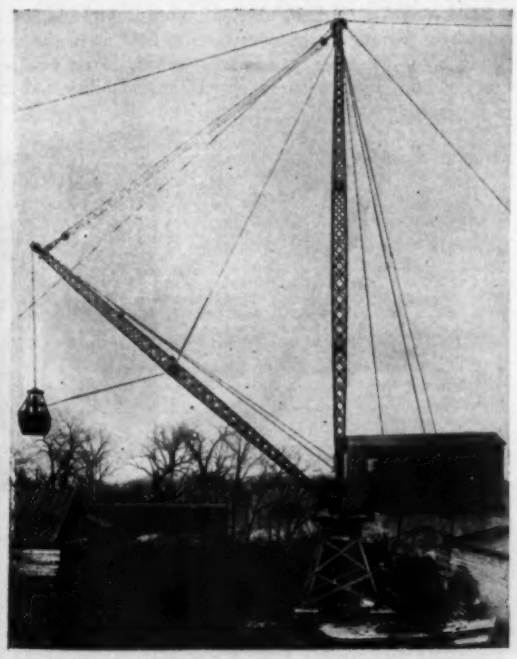

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Stiff Leg and Guy
Steel and Wood
Hand or Power Operated

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Full Rotating Derrick and Hammer Head Cranes—
Especially Adapted for Central Mixing Plants

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Distributed by
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DOBBIE {STEEL / WOOD} DERRICKS

Sheaves—Hand Winches—Blocks

Complete Stock Carried at Niagara Falls—Also G. S. Green Co., 74 Warren Street, New York City, N. Y.

Method of Towing a Heltzel Trailer Bin to a New Location

Steps in Erecting a Trailer-Type Road Bin

THE accompanying illustrations furnished through the courtesy of the Heltzel Steel Form & Iron Co., Warren, Ohio, show the successive steps in transporting and erecting the Heltzel trailer road bin, a single unit batcher plant for road contractors.

The first illustration on this page shows the bin being towed by a 3-ton truck on the wheels which are an integral part of the bin structure.

The second illustration shows the ease with which the bin is raised from its trailer position to a standing position by a crawler crane. The completion of the bin for actual road service is readily handled by the crawler crane, placing the flaring top on the sand and stone compartments as shown in the third photograph.

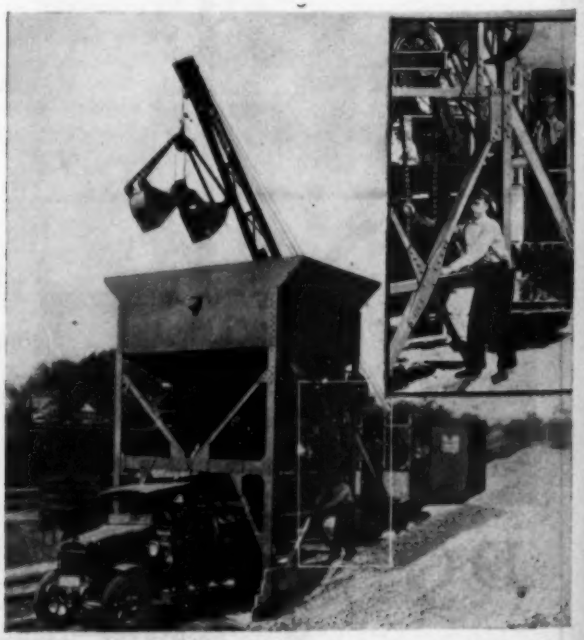
The fourth illustration shows the bin in actual operation with an inset showing the operator dumping a batch.

The value of a bin of this type is that when the end of the road job arrives it can be readily dismantled and one of the many motor trucks on the job can tow it to its new location. There is no need for employing extra help to dismantle it completely, nor is it necessary to use a big trailer, a flat car or other equipment not on the job. Two years in the field has shown the service of this bin and the value of its trailer-portability feature.

Up She Goes—A Crawler Crane Is All That Is Needed to Up-end the Bin on Its Feet as a Single Unit

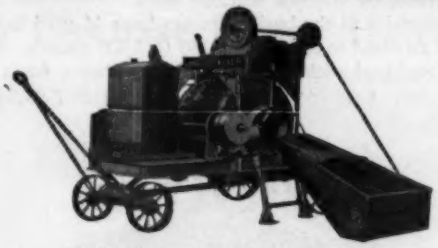
Putting the Lid in Place—The Crawler Crane Places the Flaring Top of the Divided Bin in Place as the Second Operation of Getting Ready to Load the Bins and Put Them Into Service

Manufacturers each year are paying more attention to the portability of equipment, to reducing friction losses through the simplification of machines and the introduction of roller bearings. The question of machines becoming obsolete is now becoming as important in the construction field as in the manufacturing field. A contractor cannot afford to use equipment that is not built for maximum speed, dependability and minimum operation costs.



The Bin Operating Showing the Crane Now Equipped with a Clamshell Bucket Filling the Bin and the Truck Below Taking Out the Properly Proportioned Batches

LANSING CONCRETE MIXERS



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Lansing, Michigan

More Light *for* Less Money

Do you investigate the operating costs of your emergency lighting? Some lights cost 6c to 11c an hour for 8000 candlepower. The Milburn furnishes 8000 candlepower for only 3½c an hour.

Contractors who closely investigate operating costs report important savings through the use of the Milburn Light. Patented features, exclusive with the Milburn Light, are responsible for these savings.

Write for information as to the EIGHT POINTS which will help you save money with Milburns.

Stocked in warehouses in all sections.

Ask for booklet No. 223-1 on "Lights" and 323-1 on "Welding and Cutting Apparatus."

THE ALEXANDER MILBURN COMPANY

1416-1428 W. Baltimore St., Baltimore, Md.

GALION ALL STEEL DUMP BODIES

ECONOMICAL — EFFICIENT — LONG-LASTING

HAND HOIST — GRAVITY — HYDRAULIC

EVERY BODY IS GUARANTEED FOR ONE YEAR

Send us your inquiries

THE GALION ALLSTEEL BODY CO.

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GRADER BLADES

of Superior Quality

FOR ALL MAKES OF GRADERS OR DRAGS

Snow Plow Blades, Grader Structurals, Grader & Snow Plow Moldboards, Scarifier & Rooter Teeth, Steel Frames, and shapes to specifications.

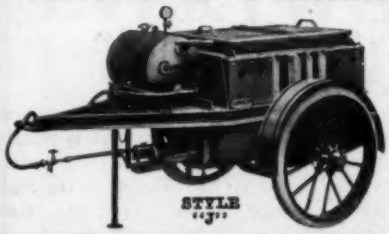
BOOTH WW1 AT THE ROAD SHOW

SHUNK MANUFACTURING CO.

P. O. Box 37-A Bucyrus, Ohio

75 Years of Fair Dealing

SPEED UP WORK BY USING



a Connery Style "J" oil-burning kettle. Here's a kettle that answers all requirements:—low fuel cost, quick heating, roller-bearing wheels and springs, absolute temperature control and solid rubber tires if desired.

We manufacture a full line of Tar and Asphalt Kettles, Oil Burning Kettles, Oil Burners, Torches, Pouring Pots, Hand Spraying Attachments, etc. Send for "Blue Book" describing our equipment.

Connery & Company, Inc.

4000 N. Second Street, Philadelphia, Pa.

Hayward Buckets

Let Hayward Engineers recommend a bucket to fit the job. The Hayward line includes Clam Shell, Orange Peel, Drag Line and Electric Motor Buckets; Dredging, Excavating and Coal Handling Machinery; Automatic Take-up Reels; Counterweight Drums.

THE HAYWARD COMPANY

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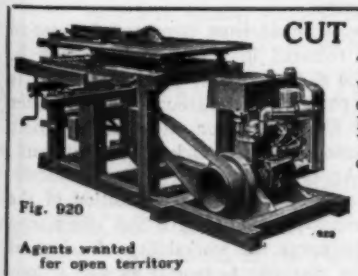

Fig. 920

Agents wanted for open territory

This portable woodworker often saves its cost on a single job. 14 machines in one. Your own shop right on the job. Quick work at less cost. Cut your bids—win more jobs. Ask about our saw rigs and hoists.

AMERICAN SAW MILL MACHINERY CO.

MAKERS OF WOODWORKING AND SAW MILL MACHINERY

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Simplex Lever Jacks · Pipe Pushers · Trench Braces · Simplex Screw Jacks · with the Visible Screw ·

Distinctive in Man Power, Safety & Simplicity

Templeton, Kenly & Co., Chicago, U.S.A.

The World's Largest Manufacturers of Jacks

Baldwin Locomotive Works, Foreign Representative

Simplex Screw Jack with the Visible Screw

The Kalman Double Marginal Bar Support

Single and Double Marginal Bar Supports for Dowels

MANY of the Western states now specify one or two marginal bars or dowels along the edge of concrete paving to prevent the breaking out of triangular sections of concrete. The single marginal bar support made by the Kalman Steel Co., Wrigley Building, Chicago, Ill., holds the marginal bar at the exact specified distance from the subgrade and forms and makes it easy to rapidly set the dowels.

The stem of the Kalman support is pushed into the ground and the bar placed in the right angle loop at the top. Then the horizontal arm of the stem is turned toward the forms. Thus the bar is automatically locked in place.

The double bar support is much the same as the single support. The sliding lock clamps the top bar into place. Then the stem of the support is pushed into the ground and the bottom bar is laid in a prong at the required distance above the subgrade.

A Clamshell Bucket with Greater Digging Power

A CLAMSHELL designed for greater digging power has been announced by the Lakewood Engineering Co., Cleveland, Ohio, for use in all kinds of digging and excavating work, including deep water dredging, digging out embedded timber or boulders, handling quarried rock and working in slag dumps.

The head of the bucket is one piece of cast steel. It has wedge sockets for dead-ending the cables. The closing cable leaves the head on the center line, thus insuring the bucket's carrying level and digging evenly. A guide sheave and three hardened rollers insure a fair lead of cable, while the reaving is straight with no S bends.

All moving parts are bushed with heat-treated glass-hard alloy steel. Pins working in the bushings are of chrome nickel, heat-treated steel but are several points softer than the bushing so that wear will be confined to the pins, which may be replaced where required without dismantling the bucket or removing it from service.

The power arm sheaves are mounted on double row ball bearings, thoroughly enclosed and protected by water tight seals. The shells are constructed of steel plate and have cast steel hinges. The cutting edges are 0.50 carbon steel with hardened edges.

Each bucket is drilled for the standard set of seven teeth. These are of alloy steel with hardened chisel points and are held in place by common machine bolts.

The capacity of the buckets ranges from ½ yard to 2 yards and the standard weight from 2,350 to 5,800 pounds. Buckets can be equipped with a spreader bar or sheave for a double holding line. Cable reaving can be varied from 2 to 5 parts as the work requires.

The New Lakewood Clamshell Bucket

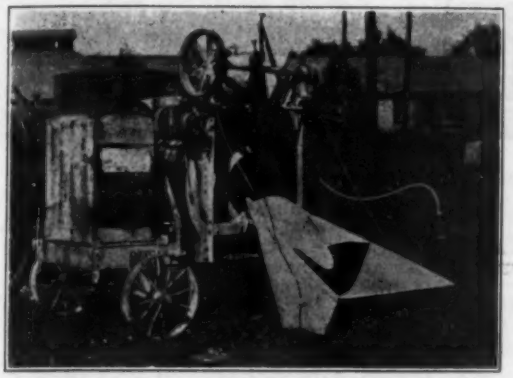
A New Concrete Admixture

A CONCRETE admixture which preserves the composition of the cement paste in concrete, and is claimed to improve the strength and eliminate crazing, cracking and dusting, has been placed on the market by the Silica Products Co., 123 West Seventh St., Kansas City, Mo., under the name Aquagel. Aquagel is supplied to contractors for incorporation in cement, mortar or concrete as a grayish white powder. It is a silicate material similar in chemical composition to portland cement and forms a jellylike mass when mixed with 25 times its weight of water. This property and its affinity for cement are probably the reason for its great value in mortar and concrete.

When a paste or slurry is made from cement and water in the proportions usually required in concrete work, that is, with a water-cement ratio of between 0.60 and 1.00, there is segregation of the coarse particles of the ground cement clinker from the finer particles. This segregation in the cement paste is a cause of crazing, dusting and hair cracks in cement work. One of the purposes of Aquagel, according to the manufacturers, is to preserve the uniformity of the composition of the cement concrete thus improving its strength and eliminating this cracking. It also improves the workability of mixes of concrete and gives greater plasticity to mortar as well as lowering the labor cost, lessening form leakage, eliminating segregation, honeycombing and patching.

Ordinarily, the proper amount of Aquagel to be used is in the proportion of three pounds for each sack of portland cement. For unusual plasticity and particularly for lean concrete or fire proofing, five pounds may be used.

Warm Concrete With A Chausse Mixer Heater



Chausse concrete mixer heaters deliver a big, clean flame direct into the mixer drum where the contents are well heated during the mixing process. They enable contractors to pour concrete the year round. Made for drum and tilting type mixers and easily applied. Dependable and satisfactory.

Other products—Portable Asphalt Plants, Oil Burning Tar Kettles, Fire Wagons, Surface Heaters and Kerosene Torches.

Chausse Oil Burner Company

Elkhart, Indiana

Where work must go on—

SAFETY and efficiency demand good light. Carbic Flood Lights make night work productive. Steady and powerful rays of Carbic light insure the job proceeding with day-like rapidity and safety

The Carbic Flood Light is simple. There are only three parts. It has unusual safety features. Any inexperienced laborer can charge it in a few minutes. A charge lasts twelve hours The Carbic Flood Light is low in first cost and inexpensive to operate.

Speed up your job by working at night with

CARBIC LIGHT

OXWELD ACETYLENE COMPANY

Unit of Union Carbide and Carbon Corporation

NEW YORK CITY: 30 East 42nd Street — CHICAGO: Peoples Gas Building

SAN FRANCISCO: Adam Grant Building

CARBIC

Carbic is distributed by the Union Carbide Sales Company through its national chain of warehouses and is sold by jobbers everywhere.

EVERYWHERE

40 ft. 6 in. Portable Belt Type Conveyor equipped with shaker screen separating three sizes of materials and delivering one size into truck

CHICAGO AUTOMATICS

Are cutting, loading and unloading costs for thousands of contractors.

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Originators of the Portable Conveyor

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Manufacturers of

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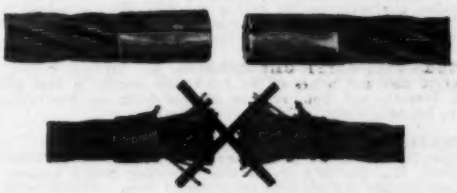
Agents in all principal cities

The New Way To Cut Cable—



(1) One man whips and cuts any size up to 1" in less than a minute.

(2) Leaves cut ends incased in steel band—the ideal whip for passing through fixtures and fittings.

(3) Easily carried in kit (weight 8 lbs.)

(4) No frayed ends—no cut hands—no delay.

Starrett Steel Band and Cable Cutter

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These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

A PORTABLE FLOOD LIGHT
A new portable flood light, known as the V G, which operates on the carbide-to-water system and delivers 5,000 candle power, is described in a pamphlet which may be secured from the National Carbide Sales Corp., 342 Madison Avenue, New York.

HOISTS FOR ALL PURPOSES
A valuable hoist manual and Catalog H, containing a complete description of the Brown hoists among the features of which are four cylinder 12-horsepower gasoline engine power, 1,500 pound capacity at 200 feet per minute, ball thrust bearings, pressure lubrication, machine cut nickle alloy semi-steel gears, flanged gear guards, suspended brake band and steel pawl, may be secured from the Brown Clutch Co., Sandusky, Ohio.

A PORTABLE AIR COMPRESSOR
A variety of types and sizes to meet every need for a portable air compressor is described in a bulletin of the Buhl Co., 405 South Dearborn Street, Chicago, Ill.

QUICK CURE FOR CONCRETE
An illustrated booklet "Curing Concrete Without Dirt and Water," giving complete data on the new Hunt process of curing concrete, will be sent to any one interested by McEverlast, Inc., 1110 Board of Trade Bldg., Los Angeles, Calif.

SPEEDY CRANE OF SIMPLE DESIGN
The Moore Speedcrane, the simple construction of which has eliminated about half the usual number of gears, shafts and bearings by means of the automotive gear shift, is described in literature of the Manitowoc Engineering Works, Manitowoc, Wis.

HOIST HAS MANY FEATURES
A bulletin containing a complete description of Dake hoists with the Timken tapered roller bearings, pressure lubrication, 4-cylinder gasoline engine, ground steel shafts and many other features may be secured from the Dake Engine Co., Grand Haven, Mich.

LUBRICANT FOR HEAVY DUTY EQUIPMENT
A lubricant for all types of modern construction equipment, including heavy duty equipment, is manufactured by the D-A Lubricant Co., Inc., Indianapolis, Ind., who will be glad to send full information on request.

FULL ROTATING DERRICK
Catalogs describing the Dobbie steel full rotating derrick as well as a full line of timber derrick fittings and hand winches may be obtained on request by any one interested from the Mundy Sales Corp., 30 Church Street, New York.

INSURING WELL-CURED CONCRETE
Dowflake, a preparation for curing concrete which is added to the mix in the form of a solution, is described in a booklet "How to Cure Concrete," by the Dow Chemical Co., Midland, Mich.

TRACTORS FOR DIFFICULT JOBS
Complete data and prices of the Caterpillar tractor in four sizes, Sixty, Thirty, Twenty, and Ten, may be secured from the Caterpillar Tractor Co., San Leandro, Calif.

AUTOMATIC ROTARY SCRAPERS
Bulletin No. 256 of the Baker Manufacturing Co., 585 Stanford Avenue, Springfield, Ill., describes its one-man automatic rotary scraper, made in four sizes for any tractor, with capacities of from 13 to 40 cubic feet and having automatic draft control to permit continuous operation.

PUMPS FOR HEAVY DUTY SERVICE
Complete information in regard to the Barnes Triplex road pumps, designed for efficiency and reliability in heavy duty service, may be secured from the Barnes Manufacturing Co., 905 Main Street, Mansfield, Ohio.

MATERIALS FOR ROADS AND PAVEMENTS
Truscon welded steel fabric, a steel mesh for reinforcing concrete roads, Truscon curb bars for curb edge protection and reinforcement, Truscon construction joints to part concrete slabs and allow expansion and contraction of the slabs without injury to them, and Truscon road forms to prevent joint-sag are described in literature which the Truscon Steel Co., Youngstown, Ohio, will be glad to send to those interested.

CLUTCHES FOR INDUSTRIAL MACHINERY
The Twin Disc Clutch Co., Racine, Wis., will be pleased to send full information and prices of its many sizes and styles of Twin Disc clutches for industrial machinery.

INDUSTRIAL ENGINES FOR HEAVY DUTY
A complete new line of four-cylinder, 6½- and 7½-inch stroke industrial engines of the slow speed type, designed especially for continuous and dependable heavy duty, is described in literature which may be obtained from Continental Motors Corp., L. J. Kanitz, Mgr., Industrial Division, Muskegon, Mich.

NEW SAFETY HOOK FOR CRANE WORK
The Public Works Equipment Co., Inc., 1776 Broadway, New York, has recently placed on the market the Bulldog safety hook which consists of a pair of hooks with flaring lips at the bottom into which the chain or cable is pushed and automatically locked in place.

HEATERS FOR CONCRETE MIXERS
The Chausse Oil Burner Co., 1227 West Beardsley Ave., Elkhart, Ind. will be glad to send to those interested complete data and prices of its concrete mixer heater which delivers a clean direct flame into the mixer drum and which is made for both the drum and tilting types.

SERVICEABLE AND LONG-WEARING PAVEMENT
A complete description of the serviceable and long-wearing Warrenite-bithulithic pavement may be secured by those interested from the Warren Brothers Co., Boston, Mass.

HEAVY DUTY GASOLINE ENGINES
The Waukesha Motor Co., Waukesha, Wis., will be pleased to send complete information to interested contractors and engineers in regard to its heavy duty gasoline engines which operate under the most difficult conditions.

WIRE ROPE FOR SAFETY
Wire rope, which insures safety when in use on construction work, is manufactured by the Williamsport Wire Rope Co., Williamsport, Pa., which will be glad to send a complete description to those interested.

TRUCKS AND ROAD BUILDERS
The Indiana Truck Corp., Marion, Ind., will be glad to send to those interested complete information in regard to its full line of trucks, road builders and dump bodies for many uses in road construction.

SIGNAL TORCHES
Torches which will burn in a gale of wind or a downpour of rain, or both, which can not be tipped over or blown out, are described in literature of the Toledo Pressed Steel Co., Toledo, Ohio.

CURING CONCRETE WITHOUT EARTH COVER
A complete description of Curcrete, a bituminous emulsion manufactured especially for curing concrete to be sprayed on the concrete immediately after finishing, is found in the booklet "Curcrete" which will be sent on request to any one interested by the Barber Asphalt Co., Philadelphia, Pa.

ALL-STEEL HAND HOIST
A descriptive circular giving full information in regard to the Beebe all steel, 5-ton capacity hand hoist may be secured by those interested from Beebe Brothers, 3219 First Avenue, South Seattle, Wash.

COMPLETE LINE OF ROAD ROLLERS
The Buffalo-Springfield Roller Co., Springfield, Ohio, will be glad to send its literature with full information about its complete line of road rollers, either motor or steam, and made in a complete range of sizes, to interested contractors.

DERRICKS AND WINCHES
The Sasgen Derrick Co., 3101 Grand Avenue, Chicago, Ill., will be pleased to send data and prices of its complete line of derricks and winches to interested contractors.

CALCIUM CHLORIDE IN CONCRETE CONSTRUCTION
A booklet No. 2053, "Solvay Calcium Chloride in Concrete Construction," containing practical information on curing structural concrete as well as a complete description of the Solvay calcium chloride and its use in concrete, may be secured from the Solvay Sales Corp., 40 Rector Street, New York.

DRILLS FOR PAVEMENT TESTING
A recent booklet published by the H. C. Nutting Co., Elmwood Place Station, Cincinnati, Ohio, contains a complete description with illustrations of the Tru-Core pavement drill for use in testing concrete pavements and bases by means of the removal of a cylindrical core of concrete.

NEW MODELS OF TRACTORS
Recent additions to the Monarch line are the Monarch 35 tractor, a track type tractor, with three speeds forward and one speed back, and an extra length track for maximum traction ability, and equipment for the models 50 and 75, which makes them weatherproof and useful in snow removal. Literature describing these models may be secured from the Monarch Tractors Corp., Springfield, Ill.

NEW HOIST FOR USE WITH TRACTOR
The Willamette Iron & Steel Works, Portland, Oregon, will be pleased to send to those interested a complete description of its new compact, self-contained single drum hoist which attaches to the rear of the Caterpillar 2-ton tractor and which has a total weight of 400 pounds.

NON-TILTING MIXERS
The advanced non-tilting models of the Kwik-Mix concrete mixer with many new features, including roller-bearing drive with heavy duty, hot-riveted and electric-welded steel drum and frame construction, are described in literature of the Kwik-Mix Concrete Mixer Co., Dept. 130, Port Washington, Wis.

COUNTERFLOW SCREENS FOR GRAVEL AND SAND PITS
A recent booklet of the Niagara Concrete Mixer Co., 40 Pearl Street, Buffalo, N. Y., describes its counterflow screens which operate on the rotary principle and which may be secured in a variety of models with either one, two or three decks.

EUCLID
Rotary Automatic Fresno

Here it is—easily operated, quickly loaded—the fastest earth-mover of them all!

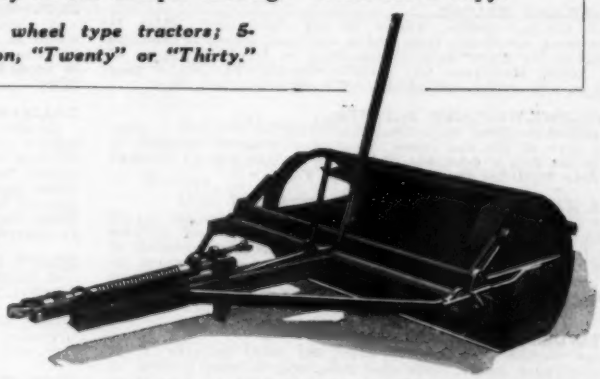
Only two motions are required to operate it:
One stroke of the hand lever to start loading
One stroke of the same lever to dump or spread

Only three simple adjustments:
(1) Digging angle (2) Depth of spread for dumping
(3) Spring adjustment for automatic cut release

Size for size, the EUCLID's the heaviest and strongest of all the fresnos.

It is described more completely in our scraper catalog. Write for a copy.

4-foot Fresno, for wheel type tractors; 5- and 6-foot, for 2-ton, "Twenty" or "Thirty."



The EUCLID CRANE & HOIST COMPANY

EUCLID, OHIO

Examine the ROGERS

At this show you'll see the popular sizes of trailers with many details of the outstanding construction features; trailers designed especially for use in localities where very low bridges are encountered, and a massive new trailer, larger than ever before built, with several new features.

Look up this exhibit when in Cleveland and write for a copy of the new profusely illustrated 32-page catalog, just off the press.

During the 1929 Road Show

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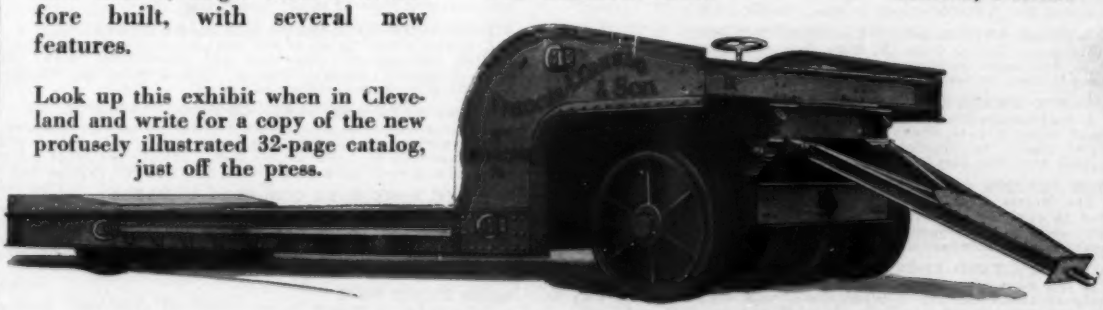
ROGERS BROTHERS CORP.

108 Orchard Street Albion, Penna.



Types with Four to Twelve Wheels

ROGERS TRAILERS

GOOSE NECK HEAVY DUTY

Capacities from Five to One Hundred Tons

NEW 100-GALLON PER MINUTE PUMP
The Homelite Corp., Port Chester, N. Y., will be pleased to send complete information and prices on its new portable self-priming centrifugal pump suitable for volumes up to 6,000 gallons per hour for pumping seepage and operated by an air-cooled gasoline engine built into the pump, the entire unit weighing only 75 pounds.

NEW CONCRETE ADMIXTURE
Bulletin 102 of the Silica Products Co., 123 West Seventh St., Kansas City, Mo., describes the use of Aquagel, a new concrete admixture which preserves the composition of the cement paste in concrete, improves the strength and eliminates crazing, cracking and dusting.

IMPROVED BIN AND MEASURING DEVICE
The Heltzel Steel Form & Iron Co., Warren, Ohio, will be pleased to send information and prices regarding its new Heltzel duplex weighing Agrabatcher with hopper bottom in two compartments and amply large enough to hold the quantities of materials necessary for the ordinary batch used in road and other types of construction work.

A 3/8-YARD EXCAVATOR
The Hanson Clutch & Machinery Co., Tiffin, Ohio, has issued a bulletin describing the features of the Hanson 3/8-yard gasoline-driven excavator, a copy of which may be secured from H. C. Dienser, Adv. Mgr.

A NEW ONE-MAN GRADER
The new one-man grader, known as the Autograder, which is constructed along automotive lines and is equipped with a Continental motor designed for heavy duty, is described in recent literature of the Good Roads Machinery Co., Kennett Square, Pa., which may be secured on request by writing to J. Warren Kitts, Adv. Mgr.

A NEW VOLUME-WEIGHING BATCHER
A new volume-weighing AggreMeter which can be attached to practically any type of bin and comes complete so that no assembly is necessary in the field is described in literature which may be obtained from the Erie Steel Construction Co., Erie, Pa.

ELECTRIC HAND SAW HAS NEW FEATURES
The new Model K. Wodack electric hand saw which weighs but 15 pounds and cuts any lumber up to 2¾ inches thick and includes among its features a saw-dust blower, a convenient trigger switch of momentary contact, a rip gage, a depth gage and a safety guard operated by gravity, is described in a leaflet which may be secured from F. L. Rogers, F. L. Rogers & Co., 23-27 South Jefferson Street, Chicago, Ill.

FOUR-CYLINDER MOTOR ROLLERS
A 36-page booklet describing in detail the many features of the Huber four-cylinder motor roller and containing a large number of illustrations of the various models may be secured by writing to Huber Manufacturing Co., A. W. Newby, Asst. Secy., Marion, Ohio.

BACK FILLER WINCH FOR USE WITH TRACTOR
The Pontiac Tractor Co., Pontiac, Mich., will be glad to send to any one interested complete information in regard to its new back-filler winch which is designed for use with the McCormick-Deering tractor.

NEW LINE OF HOISTS
The first of a new series of hoists, which is known as the Flor-Ox 35, having a capacity of 5,000 pounds at 165 feet per minute, is described in literature which may be secured from the S. Flory Manufacturing Co., Bangor, Pa.

SCOOP CONVEYOR FOR HANDLING SAND AND GRAVEL
A recent bulletin from the Portable Machinery Co., Clifton, N. J., contains a complete description of its Ace scoop conveyor which can be used for handling sand, gravel and crushed stone from hopper bottom car to storage or trucks, or from ground storage to trucks.

CONCRETE REINFORCING
The Havemeyer reinforcing bars for concrete construction, which are made to standard specifications in three designs, round flat and square, to meet the necessary requirements, are described in a booklet of the Concrete Steel Co., 42 Broadway, New York.

HYDRAULIC DIGGERS
A complete description of the new Blair hydraulic digger for use with the Caterpillar Twenty in all kinds of excavation work is contained in a folder recently published by the W. M. Blair Manufacturing Co., 3673 Michigan Avenue, Chicago, Ill.

ALL-STEEL BOTTOM-DUMP TRACTOR TRAILERS
The Smith Trailer Corp., R. Shaw Goldthwait, Sales Mgr., Syracuse, N. Y., has issued Bulletin 103, which describes Smith all-steel bottom-dump trailers for tractor haulage in trains.

A 60-TON DIESEL LOCOMOTIVE
A complete description of the new Plymouth 60-ton direct-gear-drive diesel locomotive especially adapted to industrial haulage, sand and gravel plants, construction work and short line railroads, may be secured from the Fate-Root-Heath Co., Plymouth, Ohio.

SIDE SUCTION CENTRIFUGAL PUMP
The Morris Machine Works, Baldwinsville, N. Y., will be glad to send to any one interested complete data and prices on the Morris side suction centrifugal pump, driven by a gasoline engine and mounted on a substantial hand truck.

A NEW 2½-YARD SHOVEL
A full description of the new Bucyrus-Erie 75-B, a 2½-yard shovel designed to fill the gap between the 3- and 4-yard shovels, may be obtained from Bucyrus-Erie Co., Erie, Pa.

A NEW TYPE OF GRAVEL WASHER
The Pearl River gravel washer which works on the principle of the tumbling barrel with the dirty gravel entering at one end and the clear water entering the opposite end, and which produces clean gravel free from all clay and foreign matter, is described in Folder G-1, copies of which may be secured from A. M. Lockett & Co., Ltd., A. M. Lockett, President, Queen & Crescent Bldg., New Orleans, La.

AIR COMPRESSOR WITH SUPER-CHARGER
A new 250-foot Thor air compressor which is equipped with a super-charger and which delivers 210 cubic feet of air per minute is described in literature which may be obtained from the Independent Pneumatic Tool Co., F. R. Pfaff, Adv. Mgr., 600 West Jackson Blvd., Chicago, Ill.

SINGLE AND DOUBLE MARGINAL BAR SUPPORTS
The Kalman Steel Co., Wrigley Bldg., Chicago, Ill., has issued some interesting illustrated literature describing its steel reinforcing products, including the Kalman single and double marginal bar supports for holding the marginal bars at the edge of roads the exact specified distance from subgrade and forms.

1¼-YARD DIESEL POWERED SHOVEL
The Marion Steam Shovel Co., Marion, Ohio, will be pleased to send to interested contractors full information and prices on its new 2-cubic-yard and 1¼-cubic-yard diesel powered shovels which are designed for fuel economy.

HEAVY DUTY RADIATOR FOR GAS ENGINES
A radiator made with a special heavy duty core, the tubes or water-passages being extra large to pass not only water, but dirty material in the system and thus permit filling the radiator from a brook, stream or other water available, has been developed by the Young Radiator Co., Racine, Wis., from whom complete information and prices may be secured on request.

IMPROVED WHEELBARROW WITH CHANNEL IRON LEGS
A wheelbarrow designed specially for general contractors work and which has correct balance, two-thirds of the load being carried over the wheel, and the legs of which are of channel iron guaranteed not to bend, is described in a folder issued by the Lansing Co., Lansing, Mich.

DRAINAGE POINT SYSTEMS FOR DE-WATERING
Domestic drainage point systems, designed to allow automatic separation underground of the water and gas or air and thus materially increase the water delivery from the pump, have been perfected and enable the user to obtain safety, speed and profits while working in water saturated soils by pre-drainage. A complete description of these systems is found in Bulletin No. 288 of the Domestic Engine and Pump Co., Shippensburg, Pa., a copy of which will be furnished free on request.

HEAVY DUTY ¾-YARD SHOVEL-CRANE-DRAGLINE
A complete description of the new heavy duty ¾-yard shovel-crane-dragline, which can be converted from shovel to crane, dragline, trench hoe or vice versa without disturbing the mechanism of the machine proper, and which has many other Link-Belt features, is described in literature which may be secured from Link-Belt Co., J. F. Kelly, Adv. Mgr., 300 W. Pershing Road, Chicago, Ill.

CLAMSHELL FOR USE WITH LIGHT CRANE
The G. H. Williams Co., Erie, Pa., will be glad to send to those interested a complete description of its new Universal clamshell bucket which has a number of new features and is especially designed for use with light cranes or truck cranes.

ROAD ROLLERS
A complete description of the Ames motor road roller which has many new features may be secured by those interested from the Ames Iron Works, Oswego, N. Y.

PAVED INVERT CULVERTS
The Armco paved invert culverts which are paved where the wear is hardest are described in literature which may be secured from the Armco Culvert Manufacturers Assn., Middletown, Ohio.

COPPERSTEEL BINS FOR STORAGE
Catalog 100 of the Beaumont Manufacturing Co., 330 Arch Street, Philadelphia, Pa., describes in detail its bins, which are made of copper bearing steel plates of rigid and bolted construction in all standard sizes.

PORTABLE SAW RIGS
C. H. & E. Manufacturing Co., Inc., Milwaukee, Wis., will be glad to send to anyone interested a bulletin describing its portable saw rigs which are made in seven sizes.

A COMPLETE LINE OF GASOLINE HOISTS
Bulletins G-1 and G-2 of the National Hoisting Engine Co., Harrison, N. J., contain a full description of its complete line of gasoline hoists ranging from 12 to 125 horsepower.

A FOUR-BOOM EXCAVATOR HAS MANY FEATURES
A complete description of the new B-G excavator for road digging, grading and general excavation and construction work which has many distinctive features may be secured from the Barber-Greene Co., 485 West Park Avenue, Aurora, Ill.

A STEEL BAND AND CABLE CUTTER
The Morse-Starrett Products Co., 1916 Broadway, Oakland, Calif., will be glad to send details and prices of its cable cutter which will cut any size up to 1 inch in less than a minute and leave the cut ends encased in a steel band prepared to pass through fixtures and fittings.

A TRUCK BODY WITH CONCRETE AGITATOR
An agitator truck body which solves the problem of transporting mixed concrete from the mixing plant to the job by keeping the concrete in constant agitation is described in literature which the Blaw-Knox Co., 667 Farmers Bank Bldg., Pittsburgh, Pa., will be glad to send to those interested.

4-TON TRUCK UNIT
Full details in regard to the Brookville 4-ton unit, powered by a McCormick-Deering industrial tractor with a speed range of 2 to 15 miles an hour may be secured from the Brookville Locomotive Co., Brookville, Pa.

CONVERTIBLE TRACTOR SHOVEL
Bulletin T-4 of the Bay City Dredge Works, Bay City, Mich., describes in detail the Bay City one-man convertible tractor shovel, which also operates clamshell, dragline, trench hoe or backfiller.